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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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VOL. CLXV., No. 3168.] WEDNESDAY, JANUARY 30, 1924. [76TH YEAR.

EDITORIAL NOTES.

Under a New Government.

FOR the first time in history, this country has a Socialist Government. This was brought about on Monday of last week by the combined vote of the Labour and Liberal Parties in the House; and thus, though at the General Election the aggregate voting was heavily against Socialism, a Government has been placed in power which has not behind it the will of, or any mandate from, the country. When a vote of want of confidence in the late Government was passed, through the joining-up of the forces of Labour and Liberalism, the only course His Majesty could take was to send for Mr. Ramsay Macdonald and invite him to form a Government. This was readily accepted. The opportunity was not one to be missed. But let this be said: The new Prime Minister was fully prepared; and in a most business-like and prompt fashion the new Government was formed, and the Ministers were a few hours afterwards at work in their respective departments. Over the matter there has been no revolutionary elation, and no perturbation on the part of other people. The policy of the new Prime Minister, it was quickly found, is to feel his way. In the Government, labour extremists are conspicuous by their absence; and about him the Prime Minister has gathered together as colleagues the most moderate of the prominent members of the Labour Party, and for certain high offices he has gone outside and secured the services of men of some renown in the political world. In this the new Premier has acted wisely—if not altogether happily in his choice. To leaven inexperience with experience is prudent in governmental as in business matters. Anyway the composition of the new Cabinet has helped to an extent to restore public confidence.

It is clear that Mr. Ramsay Macdonald intends to proceed warily. He knows his limitations; he is aware that one false step will see him and his colleagues dismissed from office with the same alacrity as were the late Government. The work he has taken in hand and the power that is upon him are practically strangers to him; but in every department, fortunately for the country and for him, there is a permanent staff who will assist him with knowledge and experience with the same fidelity to the interests of the country that they have always shown—no matter the party in power. But the new Government is largely one of novices, with much yet to learn of the gigantic tasks they have undertaken, and of those diplomatic intricacies and policies which mean so much to the peace of the world. But following old traditions, the new Government will have fair play. There is no intention on their part to start work in the realms of controversy. The Prime Minister is too astute to court immediate disaster in that way. The inaugural work is to be more or less non-controversial—work to which the "Opposition" can take no particular exception, other than of degree in respect of details. Approach to the larger questions can only be made by the new Government being returned to power, with an independent working majority, through another General Election. They have no present mandate from the country in regard to questions such as a Capital Levy and Nationalization; and the country is not likely to give them any such mandate. The members of the Labour Party and the votes they secured in comparison with those opposed to the tenets of Socialism and the schemes which would wreck our industrial stability and financial credit, are the testimony that they do not possess the confidence of the major part of the electors for the work they have undertaken. As things are, they cannot do much mischief. They may make mistakes and muddles—the same as most Governments. They may do an amount of good work—the same as most other Governments. We must "wait and see." But their voting strength will not carry them far, should they attempt to legislate in any direction against which in the recent General Election there was so much proclamation.

However, the objectives of those constituting the Labour Party are well known. They made no secret of them in their General Election programme; and we are well aware that they will use the opportunity of possession of office to pave the way for essays in those directions in the future, if the chance falls to them. Will that ever happen? If it does, we think the Prime Minister himself will admit, it will not be in the immediate future.

The Railway Strike.

THE railway strike came to an end yesterday morning. The terms were agreed upon at 4.30 a.m. after several hours' conference between the Railway Managers, the Executive of the Society of Locomotive Engineers and Firemen, and the trade union mediators who had been instrumental in bringing the parties together. Mr. Bromley states the settlement is very satisfactory to the men. How far this is so cannot be confirmed, as the publication of the exact terms is not expected until after this "JOURNAL" has gone to press. Before this happy issue to negotiation, which will be hailed with relief throughout the country, the following notes had been set in type for this issue.

There were three outstanding features in connection with the strike last week. They were the continued improvement in the services both passenger and goods; the return to work of those enginemen and firemen who are members of the National Union of Railwaymen, and who had, disloyally to their Union, but out of sympathy with the strikers, left their work; and the then stubborn refusal of Mr. Bromley and his colleagues to confer with the Railway Managers to consider "a way out" on the promises that individual cases of exceptional hardship should be specially examined and that there should be no dismissals. But nothing would at the time satisfy the leaders of the Society of Locomotive Engineers and Firemen short of compliance with their demand that the decisions of the National Wages Board should be discussed and overhauled, which would have meant a complete surrender of a position which is vital to the interests of industrial peace. If the railway companies conceded that the decisions of the National Wages Board should be reviewed at the instance of one of the parties, then there would never henceforth be any certainty or finality about the work of such a tribunal. Thus the Railway Companies, the National Union of Railwaymen, and the Railway Clerks' Association, were all agreed that they should stand firm by the decisions of the Board; but Mr. Bromley and his colleagues kept the strike going. The feebleness of their case and their methods, they knew, were well realized by the public. And from one piece of foolishness they went to another by making veiled threats that they would, if their demands were not complied with, cause a spread of the chaos by calling-out the men on other lines. There was also talk of the other transport organizations coming to their aid.

However, the public took in very good temper all the inconvenience to which they were subjected; and somehow

or other managed to scrape through, by the assistance of the general spirit of service prevailing everywhere. Means of transport are not to-day confined to the railways. Private possession of mechanically propelled vehicles has alone made a tremendous difference, compared with past times, during a railway strike. The week passed without signs of Government intervention, though it was known that the Prime Minister had asked the Minister of Labour to give consideration to the dispute with the view, if a favourable opportunity presented itself, of using his influence to bring about a settlement. The Council of the Trade Union Congress also continued in touch with details of the situation, so as to facilitate action by the Minister of Labour, should the time come for it.

One of the most troublesome effects in the position was that several collieries had to cease output owing to no trucks being available; and there were large supplies in wagons on sidings, but few locomotives available for the work of transporting them to their destinations. But even in these respects—particularly in South Yorkshire—there was improvement towards the week-end; and considerable quantities of coal and coke, report said, were then being moved from that area. Naturally gas undertakings suffered the absence of deliveries in common with others; and there has had to be larger recourse to stocks than is customarily the case. But, speaking generally, gas-works are in a fairly good position; and those with water-gas plants worked prudently, so as not to render themselves destitute of coke stocks. In some other industries, work in factories here and there had to be suspended; but interruption to operations was not so widespread that it made any substantial difference to unemployment.

A Good Year for the Gas Light and Coke Company.

OWING to the general disturbance of business which the railway strike has occasioned, we can only take, in the editorial columns to-day, a cursory glance at the accounts of the Gas Light and Coke Company for the past year. But that glance is sufficient to enable us to congratulate the Governor (Mr. D. Milne Watson) and his directorial colleagues, together with the responsible officials and the stockholders, on the character of the data presented and the progress that has been made during the year. In all directions it is seen that both market conditions and the efforts of those concerned in the administration and the working of the gigantic undertaking, have contributed to results over which they may be justly proud. The working has been excellent; cheaper coal, oil, and coke used in the manufacture of gas have made a good impression upon the expenditure of the year in comparison with the preceding one; and the receipts for gas have been reduced by not far short of a million-and-a-quarter sterling, which, in view of the fact that there has been an increase of about 5 p.ct. in the therms sold, indicates how much the consumers have benefited by the two reductions in price which were made in the course of the year. On the other hand, secondary products have done well, and have contributed, as will be seen later, a considerable amount above the receipts of 1922 towards compensating for the reductions in the charge for gas. This contribution, with the increased rental for meters, stoves, fittings, &c., added to the reduction of expenditure, enabled a carry-forward from the general revenue account to the net revenue account only some £141,375 short of the amount transferred at the end of 1922. In view of the tremendous benefit the consumers have received during the year by way of reductions in the price of gas, this result is extraordinarily good, and shows the great strength and vitality of the Company.

Generally glancing at the results, it is seen that, after paying the dividend on the preference and maximum stocks for the first half of the year, together with a dividend of £5 4s. p.ct. on the ordinary stock, and transferring £20,000 to the redemption fund, there is an available balance of £825,123, from which it is proposed to pay dividends on the preference and maximum stocks, and one of £5 6s. 8d. p.ct. on the ordinary stock, at the same time transferring £11,002 to the reserve fund, and a further £20,000 to the redemption fund. The dividend of £5 6s. 8d. on the ordinary stock for the second half of the year is 2s. 8d. p.ct. better than it was in 1922. These payments and transferences will absorb £597,828, leaving £227,295 to be carried forward to the credit of the present year, or only £17,060 less than was brought forward into the year. This is small in comparison with the large sum represented by the two reductions in price which were made during the year—viz., at the end of the March quarter from 10d. to 9·2d. per therm, and at the end of the June quarter from 9·2d. to 8·6d. per therm; together representing a concession of 14 p.ct. Such reductions must, given favourable weather conditions, contribute materially to the development of the sales of gas, as they have already done in subscribing an increase of 5 p.ct. to the therms sold in the past year. While mentioning this point, further evidence of business expansion may be cited. During the year, no less than 11,290 consumers were added to the register; and there was an increase of 67,253 in the number of gas stoves sold and let on hire.

During the year, the quantity of coal carbonized was 2,055,117 tons, which is an increase upon 1922 of 157,482 tons. Despite this additional consumption of coal, the cost—being £2,974,526—was £175,802 less than in 1922. The quantity of oil used in the making of carburetted water gas last year amounted to 10,689,431 gallons, or 923,809 gallons less than in 1922; the expenditure on oil being £154,380, or £49,781 less than in the preceding year. The coke used in the manufacture of water gas cost £295,123, which was a reduction of £38,392 compared with 1922. From the coal, oil, and coke used for manufacture, the total quantity of gas made was 36,570,919,000 c.ft., of which 10,020,104,000 c.ft. were water gas (976,206,000 c.ft. less than in 1922)—thus leaving the make of coal gas at 26,550,815,000 c.ft., or an average of 12,919 c.ft. per ton of coal carbonized. From the foregoing figures it is calculated that the average amount of oil used per 1000 c.ft. was 1·06 gallons. Taking the make of gas in terms of therms at the actual value of 502 B.Th.U. per c.ft. supplied, it was 183,542,483 therms, or an increase of 7,844,165 therms. From the make of gas, 33,411,955,000 c.ft. were sold, or an addition of 818,738,000 c.ft. to the sale of 1922. Rendered in therms at the actual value supplied of 502 B.Th.U., the sales amounted to 167,686,298, as compared with 160,077,324 in 1922. This shows an increase of 7,608,974 therms for the year. Taking the declared value of 500 B.Th.U., the sales were 167,059,775 therms, which is lower by 626,523 than the calculation on the actual value supplied of 502 B.Th.U. A difference of only 2 B.Th.U. between the declared calorific value and the actual value is notably close working.

Turning once more to the revenue account, the total receipts for gas during the year (bearing in mind the two reductions in price) were £6,281,393, or a reduction of £1,207,455, which, as previously remarked, shows how hugely the consumers have derived advantage from the concessions that have been made in the price. In every particular, receipts from the rental of meters, stoves, and fittings, have increased. From the secondary products, an income of no less than £2,404,487 was obtained, which is in excess of that for 1902 by £505,852. To this result coke, tar, and sulphate of ammonia all contributed, as will be seen by reference to the reproduced revenue account in later columns. The result is that the total receipts for the year amounted to £9,523,580, or a reduction of £586,774 compared with 1922. On the other hand, the expenditure was £8,144,769, or £445,400 less than in the previous year. The reduction on the one side goes far to counterbalance that on the other; and thus the amount carried to net revenue account on this occasion is £1,378,810, which is only short by £141,375 of the amount similarly transferred at the close of 1922. This is eminently satisfactory, in view of the concessions to the consumers. The congratulation which we extended to the Company in the beginning of this article is, from all points of view, completely justified.

A Question of Equity—and Encouragement.

THE editorial article which appeared in our issue of the 16th inst., bearing the title "Rewarding Consumers for Approved Appliances" invited the Engineer of the Macclesfield Corporation Gas Department (Mr. Francis W. J. Belton) to supply further information regarding his Committee's introduction of a sliding-scale of charges to the consumers, and particularly concerning the point as to the allowance of an additional ½d. per therm to those consumers who were the possessors of appliances duly approved by him. The idea is attractive. The motive for this extra rebate appeared to us to be to encourage consumers to have and use gas appliances which were of a character that would meet with the views of the Gas Engineer. There is no question that the rebate will have that effect. But this

was not the actual motive for the Committee's decision and scheme. We learn this from the interesting letter with which Mr. Belton, in response to our invitation, courteously favoured us for publication in last week's issue. The animating principle in designing the new scale of charges with the extra rebate of ½d. per therm was that of equity as between consumer and consumer; and we think it has been well met. But we are not altogether sure that, good as the system may be in producing equity in such circumstances as those prevailing at Macclesfield, it could be applied to company undertakings, with standard prices and a sliding-scale attached of prices and dividends. Such companies are more or less limited to discounts, and differential prices for varying purposes, but are inhibited from showing any preference. We doubt therefore whether the use of approved appliances would in the case of sliding-scale companies be regarded as warranting a differential charge as against consumers who possess appliances that were not approved. This by the way.

The question of equitable conditions as between consumer and consumer, arose in this way: The Committee decided to abolish simple-hire charges on cookers and gas-fires, and to supply these free of cost. The wisdom or otherwise of this policy is not the matter of discussion on this occasion. It is now the practice at Macclesfield; and that is the point from which the start has to be made in considering the development of a sliding-scale of charges, and an extra rebate for approved appliances. It was seen by the Committee and their Engineer that the unlimited supply of free fires and cookers would in all probability extinguish business in the sale of gas appliances, unless there was some inducement to purchase. To continue that business therefore demanded some form of encouragement. Then, further, as apparatus supplied by the Department is maintained free, while apparatus purchased by a consumer has to be maintained by him at his own cost, he would be placed in an unfavourable position compared with the consumer provided with appliances and maintenance free of all cost. Here steps in equity. It would have been quite easy for the Committee to decide to undertake the free maintenance of privately owned appliances, as well as those provided by the Department. But that plan would not have provided any inducement to purchase. It was therefore decided to meet the two requirements by one method—by giving the consumer who owns his own appliances some benefit in the price of gas; thus compensating him for having to maintain the apparatus at his own expense, and simultaneously providing an incentive to the purchase of appliances. That it is an incentive is proved by the fact that during the past four months the Department have sold upwards of £1000 worth of apparatus, which must be accounted good for a town of the population of Macclesfield, having regard to current trade conditions. It may be taken, therefore, that the rebate is a real stimulant to the private ownership of gas appliances, in view of the free supply of cookers and fires by the Department. But, in passing, look at the matter from the point of view of consumers who are supplied with free appliances and maintenance. They have nothing whatever of which to complain. But we would suggest that the word "free" is somewhat discounted by the fact that they pay ½d. per therm more for gas than the consumers who obtain the rebate through being the owners of approved appliances. However, there is no discrimination between consumers. Those who purchase gas through prepayment meters can obtain the rebate as well as consumers who purchase through ordinary meters; and it is understood that many have availed themselves of the advantage offered.

A point which occurred to us when originally considering this matter was as to the assurance the Department would have that there was retention of the approved appliances, and that they were maintained in a condition which could also be approved, and which is one of the objects for which the ½d. rebate is allowed. Mr. Belton has satisfied us on this point; and we can see that the rebate and this particular object give the Department a measure of control through inspection and advice which would not have been available to the same extent (the new powers granted by the Macclesfield Act of last session notwithstanding) in other circumstances. The procedure to obtain and retain the rebate, Mr. Belton informs us, is as follows: The consumer applies for the rebate, giving a statement of the apparatus which belongs to him or the Corporation. An inspection follows; and if the claim is correct in regard to the privately owned apparatus, and approval is justified, the extra rebate is granted. Not only is the inspection and advice made and given at the initial stage of the rebate coming into operation, but a periodical re-inspection is made, in order to obtain assurance that the apparatus is still in existence. This again gives the opportunity for advising the consumers. The experience is that consumers in these circumstances are always grateful for advice, and for information respecting the efficient use of their appliances. There is no doubt that the rebate of ½d. per therm for a specific purpose establishes a new association between gas supplier and consumer, which will well serve both of them.

Power Charges and Suction Gas Competition.

NOT only the ordinary, but the power, consumers have been given consideration by the Macclesfield Corporation Gas Department, with the view of realizing a better business footing between them and the Department, and of placing the latter in a stronger competitive position in relation to other power agents. Commercial practices must always be rearranged, if better than existing ones can be found, to meet new conditions. The price of gas for power now depends upon the consumption per annum per B.H.P. of maximum demand. This is found to be an inducement to patronize town gas, and to reject the overtures of competitors. In Macclesfield, there are a large number of suction-gas plants, which use town gas for starting-up; and in considering the revision of charges, the surprising fact was discovered that the power consumers who would benefit most under an ordinary sliding-scale of prices were the owners of suction-gas plants. This is not fair; and it is not good business. The incidence of their demand is not the best for a gas undertaking; it is a short-time demand, and falls inopportunely. As Mr. Belton points out, they simply use town gas as a convenience; they come on the mains for a big supply when there is a large consumption of gas at the breakfast hour; and they take no more gas during the remainder of the day. Such patronage is not so profitable as that which requires a steady supply throughout the day—whether large or small. The Department therefore sought a plan to bestow an advantage not upon the power consumers who use a large quantity, but upon those who are the most regular consumers. Under the scale adopted, taking the consumption per B.H.P. per hour at 10,000 B.Th.U., any power consumer, no matter the size of his engine, and who runs it for 2000 hours per annum at the maximum load, will obtain his supply at the minimum price. The charges are: Consumption per B.H.P. of maximum demand—Under 160 therms per annum, 7·5d. per therm; 160 therms and under 180 therms per annum, 7d. per therm; 180 therms and under 200 therms per annum, 6·5d. per therm; 200 therms and over per annum, 5·25d. The efficacy of the system in competition is attested by the final paragraph in Mr. Belton's interesting letter: "Since the introduction of this "new scale for power, we have obtained, in competition "with such gas, new consumers totalling over 400 H.P."

The Power to Specify and Inspect.

WHILE the responsible men of the gas industry are satisfied that a large proportion of the accidents that occur in connection with gas supply are due to neglect of obvious slight defects in apparatus, and are also aware that complaints of insufficiency of supply and inefficiency in use are generally due to inadequacy of piping or unsuitability of fittings and apparatus or their misuse, there are a considerable number who hesitate to obtain powers to cross the thresholds of their consumers' premises to ensure that all is as it should be the other side of the meter, though that is the place which is vital to business extension and maintenance. After the Board of Trade conference at which the subject of gas accidents was under consideration, the question of conferring powers of specification, inspection, and refusal to supply if the conditions of the equipment of houses and other premises was not what it should be, there came the usual talk as to the wisdom of incurring the additional obligation. Our opinion is, and always has been, that the eradication of conditions in gas application and use that are inimical to the interests of the industry, and the establishing of conditions that are preservative of those interests, are highly essential to the future of the gas business, in view of the growing intensity of competition, and the need of the

industry not to allow anything avoidable to impede its rate of progress. But weighty as this argument is, it does not produce the activity in this direction that we believe to be desirable.

Nevertheless, while some men are talking and hesitating, and others are advocating, it is found that there are men who are taking the earliest possible opportunity of obtaining the needful powers. There are now in existence several Private Acts which confer the necessary authorization to specify piping and fittings, to inspect, and to refuse to supply gas in inappropriate circumstances. One of the latest examples is the Macclesfield Corporation Act of last session; and while the subject is under consideration, it may be of advantage to draw prominent attention to the terms of these typical powers. In the first place, in order to ensure a satisfactory supply, the Corporation are authorized to specify the size and material of the pipes and fittings to be laid by a consumer on his own premises, either in the first instance or on the occasion of any renewal; and, if they think fit, they may make different specifications for different classes of premises, having regard to the probable maximum consumption of gas at any one time. It is enacted that the specification shall be published either twice in some newspaper, or once in each of two newspapers circulating within the gas limits, and a copy is to be kept exhibited at the Corporation Offices. Every meter used in a new building or a building not previously supplied with gas, or in connection with a new or substituted pipe laid by the consumer, is to be placed as near as reasonably practicable to the Corporation main, but within the outside wall of the building. When any pipe, fitting, or meter has been installed, notice is to be given to the Corporation; and the pipe is not to be covered until after the expiration of twenty-four hours from the service of the notice. Any duly appointed officer of the Corporation may, between nine o'clock in the morning and five o'clock in the afternoon, attend and inspect and test the pipes and fittings and meter; and, if he is not permitted to make inspection or test, or if the pipes or fittings are not according to specification, or if the meter is not placed as required, the Corporation may refuse to supply gas until the provisions of the section have been complied with. There is protection for any person to whom a supply of gas is refused. He may appeal to a Petty Sessional Court, who may, after hearing the parties, and considering any questions as to the reasonableness of the Corporation's specification, make such order as seems proper in the circumstances, and may direct by which of the parties the costs of, and incident to, the appeal shall be paid. The word "fittings" is defined as meaning pipes, burners, stoves, heating apparatus, and other fittings used in connection with the consumption of gas. These provisions are not to apply to any railway company or committee of two or more railway companies.

The powers are comprehensive. They are all that is required. In such powers, there is an assurance for the future not existant in places where similar authority does not obtain. Under the powers given by the section, a specification is shortly to be published, and put into operation, in Macclesfield. The powers, we repeat, are not original; but the Act provides one of the latest examples. It will be a good thing when the possession of such powers becomes more general.

World Power Conference.

There was neglect at the initial stage in not inviting the gas industry to be participators in this. The gas industry is by no means a negligible quantity in regard to power, although some electrical men like to think it is. However, the lack of complete recognition in the matter has been removed. Certain representatives of the gas industry had been invited to read papers at the conference. That was all. As a result, however, of interviews between the promoters of the conference and the President of the National Gas Council (Mr. D. Milne Watson) and Sir Arthur Duckham, five representatives of the gas industry have been invited to act as Vice-Presidents and to serve on the Grand Council. Appropriate representation on other Committees will also be given to the industry. A Gas and Fuel Section has been formed, of which Mr. S. S. Ogilvie is the Hon. Secretary.

Mains of Insufficient Capacity.

The clause relating to mains of insufficient capacity has, in Acts of Parliament, quite a good representation. It is now becoming a notorious clause through the action of the railway companies in opposing it in Special Orders, and through the consequent discussion which is taking place to ascertain whether or not it can be modified in such a way as will meet their views, without creating any hardship upon those undertakings who may meet with circumstances in which its application would be an advantage. The latest idea of the companies is that there should be a proviso to the clause that "the provisions of this section shall not apply to a supply of gas required by any railway company." It is understood that the Central Executive Board of the National Gas Council are of opinion that this amendment should not be made; and they suggest a further conference on the subject.

The Miners' Wages Negotiations.

As already mentioned in the "JOURNAL," three months' notice has been given to terminate the miners' wages agreement, with the view to securing its amendment—failure to accomplish which, after twelve months' endeavour, has led to the present position. Now a further complication has arisen which may somewhat impede negotiation. Three of the miners' leaders who have been assisting in this matter have been appointed Ministers of the Crown. They are Mr. Stephen Walsh, Mr. Vernon Hartshorn, and Mr. Frank Hodges; and they are now debarred, by reason of holding Ministerial office, from taking further part in the negotiations. These three leaders had an intimate knowledge of the position which it will be difficult, if not impossible, to replace by substitutes. Anyway, the changes will greatly delay matters; and there is really no time to lose, seeing that the notice, if carried into effect, will bring the agreement to an end on April 17. It is a misfortune that these changes should have come at such a critical time.

Low-Temperature Coke and Gas-Fires.

It would really be of interest to know if Mr. David Brownlie has been retained to sing the praises of coalite in the Press, or whether he is doing it disinterestedly in what he believes (rightly or wrongly) to be the interests of the public. Whether or not this letter writing is voluntary, we cannot help suggesting to him that he is indulging in postulations with regard to gas-fires which are unjust to the modern types. It is obvious that he knows less about the gas-fire than he does about boiler-firing. He has recently been writing to "The Times," and now another letter has been inserted from him in the "Financial Times." This is largely a *réchauffé* of what has been previously published. Here is a sample of what he has to say: "The wholesale use of gas for household heating is obviously impossible, because of the danger, the smell, the escape of partially burnt gas, and generally oppressive feeling, and, above all, the price (say) 10d. per therm." Quite apart from the testimony of research, having for the best part of a lifetime lived in rooms lighted and heated by gas, and on food cooked by the same means, we can only characterize the words quoted from Mr. Brownlie's letter as extremely foolish. Cannot coalite make headway without giving a false character to a popular rival? By the way, too, when is Mr. Brownlie going to supply us with the analyses for which we asked him in our issue for Jan. 16, p. 138?

Institution of Public Lighting Engineers and Superintendents.

Public lighting is a matter of extreme importance to the community; but, strange to say, hitherto there has never been any organization, giving means of conference, for those to whom is entrusted the work of this particular communal service. Those officers know well the importance of good public lighting; and they are well acquainted with the principles that constitute such lighting, in connection with which knowledge has expanded considerably the last few years. Street lighting is really a science and an art now; and rule-of-thumb procedure has no place in securing for the community that efficiency and economy which is necessary. The service is one which, in our opinion, should be confided to a specially qualified officer, and not be under the control, as is often the case, of a department supplying a lighting commodity. Independence in this respect gives scope for the production of the highest efficiency and economy, irrespective of the agent—gas or electricity. However, the Institution of Lighting Engineers and Superintendents has been formed; and we welcome it. There is plenty of work for it to do in helping to improve public lighting.

and to keep abreast of all those inventions that tend to improvement. Mr. S. B. Langlands, of Glasgow, is the first President; and Mr. W. J. Liberty, the City of London Public Lighting Superintendent, is the Hon. Secretary. The first meeting is to be held in London on Feb. 15; and an excellent programme has been arranged. Regarding this, particulars will be published next week.

Gas Accountancy.

In another part of this issue will be found the report of a lecture on "Gas Acconntancy" given by Mr. H. E. Ibbs, the Chief Accountant of the Gas Light and Coke Company, to the School of Accountancy Students' Association. The lecture deals, as it is bound to do, with much that is elementary; but, as we are sure it will be followed with great interest and benefit by a very large number of readers, we are reporting it fully. The concluding part of the lecture will appear in our next issue.

Benzole Production.

A special article in the "Petroleum Times" refers to the increasing production of benzole—not in this country, but in others. There has been an amazing growth of its production in the United States, notwithstanding the abundance and cheapness of petroleum motor spirit in that country. The approximate figures in gallons at five-year intervals for the period beginning with 1906 and ending with 1920 are as follows: 1906, 400,000; 1910, 1,500,000; 1915, 9,000,000; 1920, 70,000,000. Much of the later development in production was stimulated by war requirements; but even in 1911 the value of benzole as a motor spirit was appreciated. The present production finds its main outlet for motor-spirit blends. Large as is the present United States output, it is said that it by no means represents its full potentiality from the coal carbonized and the gas produced. However, it seems probable that henceforth very little will remain unutilized, or be allowed to continue as a "mere" heating constituent in town gas. In Germany, benzole is produced in very large quantities. Indeed, it is asserted that ere long that country will use this home-produced motor spirit entirely, and will no longer need to import petrol spirit. In Great Britain, the production of benzole in recent years has been declining, mainly on account of the competition of low-priced petroleum spirit. In 1918, when the large gas companies were stripping gas, the production was 26,400,000 gallons; but this had fallen in 1922 to 11,155,757 gallons. It is estimated that the coke-oven and town gas made in Great Britain would yield about 46,000,000 gallons of benzole if all was recovered; and doubtless, with higher prices for competing petrol, the industry would rapidly revive.

PERSONAL.

His many friends realized that in Ireland last June Mr. W. DOIG GIBB, O.B.E., M.Inst.C.E., was far from well; and until recently his work has been carried on to the accompaniment of medical advice. We are pleased to state, however, that he is now entirely restored to health and freed from the doctor's hands.

Increasing activities have compelled Mr. W. J. LIBERTY to resign ordinary membership of the London and Southern District Junior Gas Association, of which he was one of the founders and President for two years. The Hon. Secretary (Mr. Leonard Lacey) has expressed the regret felt at Mr. Liberty's decision, and has informed him of the unanimous decision of the Council, in recognition of the great service rendered by Mr. Liberty in the past, to transfer him from the list of ordinary members to that of honorary members.

Mr. P. G. WRIGHT, the Leeds District Manager for Messrs. Stewarts and Lloyds, Ltd., Glasgow and Birmingham, recently completed fifty years' service with the Company (thirty years with Messrs. Lloyd and Lloyd, Ltd., and the remaining twenty with the amalgamated Company). In commemoration of the event, the Directors presented Mr. Wright with a piece of silver plate, and some of his old colleagues on the staff gave him a gold cigarette case.

Alderman S. MORRIS has resigned his position as Chairman of the Doncaster Gas Committee; and a vacancy has also arisen through the death of Alderman Kay.

Yorkshire Junior Gas Association.—An account of the Association's interesting day at Halifax last Saturday, together with the Presidential Address of Mr. W. Heathcote, has come to hand; but the accumulation of other copy over the week-end, consequent upon the disorganization resulting from the railway strike, compels us to hold over the report of the meeting.

OBITUARY.

HENRY MORLEY.

It is with regret that we have to record the death of a very old friend, Mr. Henry Morley, M.Inst.C.E., who passed away, on the 18th inst., aged 76, at the Teignmouth residence to which he retired in 1909, on relinquishing, in consequence of failing health, active work in the industry.

Previous to his retirement, Mr. Morley had occupied for 27 years the position of Engineer and Manager of the Cardiff Gas Company, in which he succeeded the late Alderman Bowen in 1882. Before that time, he had spent six years as Assistant Engineer at the Salford Corporation Gas-Works. Deceased was born in Manchester in May, 1847, and was the son of Mr. Charles Morley, for many years Inspecting Engineer for the Manchester and Liverpool section of the London and North-Western Railway. Educated in Manchester, he was subsequently articled to Messrs. Walter Mabon and Company, gas engineers. During his management, the Cardiff Gas Company made very rapid strides. The population grew enormously; and, owing partly to the laying of mains in many new areas, the increase in the number of consumers was even greater in proportion, with the result that the make of gas went up by leaps and bounds. Naturally this development in business necessitated vast changes and extensions of the plant for the production of gas, and this work from time to time received full notice in the pages of the 'JOURNAL." Mr. Morley also demonstrated his skill as an architect in the designing of the offices which were erected on part of the site of the old works at Bute Terrace. When announcing in April, 1909, the forthcoming retirement of Mr. Morley, mention was made of the fact that Mr. George Clarry, the Secretary of the Company, had been appointed to the position of General Manager, and had of late years been entrusted with the whole of the development business connected with the undertaking. Our late friend was succeeded as Chief Engineer by Mr. H. D. Madden.

Mr. Morley retained his membership of the Institution of Gas Engineers after his retirement, and it was only last year that (acting under his doctor's wish that he should be entirely free of any business engagements) he resigned the office of Hon. Treasurer to the Wales and Monmouthshire District Institution of Gas Engineers and Managers, which he had occupied for eighteen years.

The interment took place at Teignmouth last Wednesday.

Mrs. Main tenders her sincere thanks for all the kindness and sympathy shown in her recent sorrow. The many proofs of affection and regard for her husband, Mr. Archibald P. Main, are, she says, a real consolation, and will always remain a precious memory.

It is with regret that we record the death of Mr. HENRY SOMERSON FREEMAN, M.Inst.C.E., who died from pneumonia at his residence at Nutfield, Surrey, on Tuesday, the 22nd inst., in his 82nd year. Mr. Freeman entered the service of the Wandsworth and Putney Gas Light and Coke Company in 1869, as Engineer. This office he held for over 28 years, and then for a short period became Consulting Engineer. He was afterwards elected to the Board of the Company, and, at the amalgamation in 1913, became one of the Directors of the Wandsworth, Wimbledon, and Epsom District Gas Company.

National Gas Exhibition.

From Mr. R. J. Rogers (the Hon. Secretary) we have received a copy of the final report of the Executive Committee on the National Gas Exhibition, which was held in Bingley Hall, Birmingham, from Sept. 17 to Oct. 3 last. This is accompanied by a summary of income and expenditure—which amounted to £3460 14s. 4d. The receipts were mainly made up by contributions from 149 undertakings, £3451 0s. 1d. Mr. Rogers remarks that the final report, in conjunction with the catalogue, will provide a complete record of the exhibition, the success of which is being reflected in the increase of orders and inquiries in so many quarters. The report deals at length with the support obtained, and the work carried out and brought to a successful termination; and we feel sure the Committee are amply justified in their hope that the "supporters have received satisfaction and encouragement, and that the exhibition did in some measure advance the cause of the gas industry throughout the country."

Royal Sanitary Institute Congress.—The Most Hon. the Marquess of Salisbury, K.G., P.C., G.C.V.O., C.B., has consented to accept the office of President of the Thirty-Fifth Congress of the Royal Sanitary Institute, to be held at Liverpool from July 14 to 19 next.

Commercial Gas Company's Dividend and Price.—The Directors of the Commercial Gas Company recommend dividends for the half-year to Dec. 31 at the rates of 6 p.ct. per annum on the 4 p.ct., and 6 p.ct. per annum on the 3½ p.ct. stocks. The dividends were at the same rates for the first half of the year, and compare with an average of £5 16s. p.ct. and £5 15s. p.ct. respectively for the year 1922. The price of gas has been further reduced as from Jan. 1 last by ⅛d. per therm, making the present price 8⅛d. per therm, or 3s. 5⅛d. per 1000 c.ft.

ELECTRICITY SUPPLY MEMORANDA.

AN important matter was dealt with at a recent informal meeting of the Institution of Electrical Engineers. It was on the troubles experienced with electrical appliances. The fact that this was the subject is eloquent evidence of the existence of "troubles." The discussion was opened by Mr. J. W. Beauchamp, Director of the Electrical Development Association. It was rather unkind to allocate to him such a task. He made a little protest against having to perform it—seeing that he spends so much of his time in assuring people that there is nothing of the kind. Of course, he ought not to do this. Integrity forbids. But it is his business to minimize the troubles. Such "little" ones as there are, he asserts, are easily curable. They are not. In the best of constructed appliances, they occur; and not only are there organic troubles, but the appliances and their users are the victims of the mishaps that may and do occur at the generating station and on the distribution system. It is no use to say there are no difficulties, because most users know differently. However, Mr. Beauchamp belittled them. According to the paragraphs that have been published regarding the discussion (full reports of the confessions made are not, so far as we can find, visible anywhere), he said: "Some of the troubles arising from minor oversights of design and assembly are rapidly being eliminated, and most of them from unsuitable application or wrong handling by the user." Let any electrician consider these words, and see how ample is the cover in them to much which the consumer has experienced, is experiencing, and will continue to experience. "Oversights of design and assembly" apparently readily occur, and are many; obviously, too, it is quite easy to construct unsuitable appliances; and it is manifestly simple for the consumer to indulge in wrong handling. Why should all this be in connection with electrical appliances, unless they lend themselves to these things? Moreover, there are troubles arising from physical causes, which neither the manufacturers nor suppliers of the appliances can eradicate. Even the "Electrical Review" in a comment exercises the most pronounced care in not specifying the troubles. It says: "We do not propose to refer in detail to the various ills from which electrical appliances, like human beings, are inherently liable to suffer." "Fortunately," it adds, "the faults that occur nowadays are very few compared with those that happened pre-war days." Then we do not wonder at the slow progress that domestic electrification has achieved. And the work of minimizing the inconveniences goes on. The "Review" says: "Every household appliance, whether associated with water, gas, or electricity, or even coal, is liable to develop a fault at some time or other." But it should be recognized that faults vary in degree and frequency; and none of the appliances mentioned develops such faults as electricity, and certainly not so frequently and suddenly. When they do occur in those other appliances, an expert is not always required to put them right. We would again remind our readers that there is one thing that even an expert cannot alter, and that is the potential heat energy of a unit of electricity.

Under Cover.

Maintenance Recommended.

The troubles with electrical appliances are admitted, though reluctantly. The very selection of the subject for discussion is evidence of a reality, and not of something rare, small, and innocuous to the interests of electricity. Mr. Beauchamp, we are in few words told, urged the importance of ready and expert service. The "Electrical Review" emphasized the point, by saying several things regarding it. For example, suppliers of water and gas in many cases undertake to maintain in good order for a small quarterly charge apparatus connected with their services. Some of them do it for nothing, so far as labour is concerned; but the maintenance of gas appliances is usually for the purpose of ensuring that they are kept in a condition to render, with proper use, maximum efficiency, and not so much on account of any failure in structural condition, or a possible approach of organic deterioration. There is very little to go wrong in gas-heated appliances of any kind. The "Review" waxes eloquent over maintenance. "An efficient maintenance service turns latent hostility into active friendship, and is a most potent means of developing the use of electricity." What gas suppliers are doing, is used to stimulate electricity suppliers to do the same thing. We read: "The gas suppliers are giving close attention to the subject in their own sphere, which more and more tends to become heating rather than lighting. In order to compete with them, and to give the electrical equipment an equal opportunity to display its unquestionable superiority, the institution of efficient maintenance by electricity suppliers is an urgent necessity." Why is it an "urgent" necessity, if the troubles are small and insignificant? We will not pursue the argument; it is unnecessary. If there is the "unquestionable superiority" in electrical appliances and operation, gas appliances would not be so popular, and electric appliances would have less difficulty in making headway. Electrical men know well that the published paragraphs regarding the discussion on troubles are modest in their revelation of what was said on the occasion; and we are not surprised, for—

"Conscience doth make cowards of us all."

Life of Boiling-Plates.

The most inefficient part of an electric cooker is the hotplate; and it is the part that costs most in maintenance. Gas boiling-rings are good-natured contrivances which will run for years without renewal; the fact being there is nothing about them to result in a short life. They have no particular care as to the calorific value of the gas supplied to them, or its pressure. These things do not affect their lives. Variations make a difference to efficiency and speed, but nothing else; and the difference is minimized if means of air regulation are provided. Electric boiling-plates, on the other hand, are very particular about their voltage; and life may be lengthened or shortened according to whether the voltage is lower or higher than the rated. The writer of "Cooking and Heating Notes" in the "Electrical Times," in a discussion of this matter, says that the most important factor in the life of a boiling-plate is its speed of operation. To produce a boiling-plate which will be quick in service and have a reasonably long life under service conditions, he says, is the real difficulty with which manufacturers have to contend. While up to a point it is true that practically any degree of reliability can be secured, but only at present by the sacrifice of speed in service, it is not altogether so. Reliability of electric boiling elements depends on more than the factor of the speed of operation; it also depends on use, and the conditions to which they are exposed. Boiling elements, for instance, have a strong objection to having liquids spilt upon them when they are hot. To have quick operation is largely a matter of high loading; but constructional difficulties arise if this is carried too far. It is obvious, but we are told, there is a limit to the length of resistance wire of any particular gauge which can be accommodated in a given area—for instance, under an 8-in. boiling-plate. There is a limit to the quantity of liquid which a pint pot will hold. That by the way. Above the limit in respect of a boiling-plate, higher loading can be obtained by duplicating the elements; but the use of thinner wires, which this practice involves, has a detrimental effect upon the reliability and the life of the plate. The difficulties of the designer of electric appliances are truly many.

How it May be Done.

However, we are told that one manufacturer has got over the difficulty by arranging duplicate elements superimposed one above the other—a construction which, of course, makes possible the use of heavy-gauge wire. We should imagine that this arrangement of the elements would rather diminish the efficiency in relation to the expenditure of current. However, it is stated that by this means it has been possible to load an 8-in. plate to 1600 watts; and a useful life of at least twelve months is claimed. It is understood, too, that experiments are proceeding with loadings up to 2000 watts; and if there is success, it is considered that this will be a notable achievement. It is hoped by this means to secure an efficiency and speed of operation by which it will be possible to boil 2 pints of water in about six minutes. It will be observed that this is only a hope; but, if achieved, it would mean that two pints of water would be boiled at an expenditure of 0·2 unit; and an efficiency of upwards of 60 p.ct. would be obtained, which would leave present boiling elements far in the rear. Round about 40 p.ct. (with slow operation) is the present efficiency of electric boiling-plates, when new; so that the electricity industry would have cause to congratulate itself on the higher performance, as it would be an excellent trading point for them, in view of the work done on the hotplates of gas-cookers. However, our friend of the "Electrical Times" is of opinion that speed of operation and reliability are more important factors than long life. Reliability and life usually go together; but our contemporary thinks that, if speed of operation and reliability were realized, a life of only a few months would not be a serious drawback. Apparently they have not yet been realized; and so slow speed and unreliability are existing defects of the electric boiling-plate.

A Challenge.

Electrical people have often been challenged to justify their assertions, by comparative demonstrations, as to the superiority of electric cookers and other apparatus over gas appliances. Only once was the challenge taken up; and in the result there was cause for regret by the electrical enthusiast who accepted it. Several municipal authorities are now exploiting the electric cooker; and the usual inflated statements are being made as to their capabilities in comparison with gas-cookers. Exaggerations are chickens which frequently come home to roost; and when consumers find they cannot obtain the range of service with the electric cooker that they realized with the gas-cooker, disappointment develops. Mr. Gamble Marks, who, as is well known, is a specialist in the operation of gas-cookers, is anxious to come to grips with electrical men who claim a superiority in all-round service for the electric over the gas cooker. We gather this from a letter which he wrote, and which has appeared in the "Southport Journal." He says: "If any maker believes he has on the market an electric cooker which will bake bread, meat, cakes, pastry, or boil water as quickly, as cheaply, or equal to a good trade gas-cooker of the same size, here is an opportunity to prove it by practical public test. I have £100 now ready to put down for gas. Will the electricity people put down a similar amount—the winner to take the lot. I hold no brief for any gas-

stove maker or any gas authority. Having tried both gas and electricity for demonstration work, I am only anxious the general public should know the facts." We wonder if any electrical partisan will write to Mr. Gamble Marks, and accept the challenge. No doubt some would be willing to do it, if the results could be kept secret; but we prefer publicity. If the challenge is accepted, current and time expenditure must be carefully noted during the trial.

Lights and Eyesight.

There are some illuminating engineers—trained, tried, and trusty electrical ones—who are beginning to think that a bit too much has been urged as to the effect of high intrinsic brilliancy lights upon our delicate organs of vision; and they are doing a little discounting of what has been said. It is rather late in the day to withdraw; an obstacle to this being the effects in large institutions—such as banks and insurance offices—of the crude application of high intrinsic brilliancy lights which obtained before the principles of correct installation were formulated and advocated. It would be a great pity to permit scientific principles to be assailed, and people to think there is little in them. This would mean that we should soon be getting back to the wholesale crudeness which attended the introduction of gas-filled lamps, and which so much has been done to remedy in the interest of public eyesight. Mr. Elihu Thomson, of West Lynn, Mass., has written to Mr. Leon Gaster, who is the banner bearer of illuminating engineering in this country, corroborating some opinions expressed by him nearly twelve months ago in an article on "The Effect of Light on the Eyesight." Perhaps nobody has said more than Mr. Gaster as to the bad effects of high intrinsic brilliancy on our eyes; but apparently his views have been relaxed, seeing that Mr. Thomson, in his letter says: "I am satisfied that the forms of artificial illumination used are no more injurious than the sun's rays, and, of course, there is no approach to the intensity of open sunlight in any proper forms of illumination. If personal testimony is worth anything, may I say that, although I have exposed my own eyes, for a period of at least fifty years, to strong lights of various types, from powerful arcs down, I find that my sight is certainly not worse than would be expected to be possessed by one of my age. In fact, it is probable that my sight and the control of my eyes is better than the average. I have read in dim lights, and I have read in strong lights. I have read extensively; and I am convinced, from my own experience, that a great deal too much is made of eyestrain, as connected with forms of artificial illumination. I had rather look into the nervous condition of the individual, as to general health, tone, habits, &c., for any failure of the faculties in this regard." It is absurd to compare sunlight with the lights with which at close quarters work is done, or inspection of goods is made in shop windows. If we read in sunlight, we are soon glad enough to do something to shade the paper. However, Mr. Thomson must be congratulated. He is not as many other men, women, and children are. Eyes vary the same as other parts of the human structure. We have seen strong men with weak eyes; and we have known them with bald heads. We know of frail looking people with good eyesight and splendid heads of hair. The protection of the eyes from strong lights is a matter of importance. We hope there will be no withdrawal from the sane higher standards of application which have been set up.

Water Pollution by Gas-Works.

The December "Bulletin" of the Swiss Gas Association gives the full text of a long paper on this subject read by Prof. Dr. E. Ott, of Zurich, at the annual meeting last September. He discusses the characteristics of the waste products of the ammonia and tar distilleries, of the benzole extraction plant, and of steam engines and other objects. Interesting tests are detailed of the effects on various kinds of fish of different concentrations of waste liquor from the ammonia plant. These were carried out with the idea of trying to arrive at some kind of safety factor, particularly for the phenols contained in the liquor. Fowler's biological method of rendering it innocuous is dealt with in some detail as the "only method worth discussing." It is the phenol contents which make the tar-distilling waste so harmful, but quantities here are, of course, smaller than from the ammonia plant. In Zurich it is dealt with by being dripped on to the producer coke, where it is split into water gas and tar gas by the heat from below. In summarizing, Dr. Ott gives his opinion that such waste products should never be run into open waters. Even if the safety factor is never exceeded at any one outlet, the cumulative effect is bound to be harmful. At the same time, he appeals to all authorities concerned to try to appreciate the difficulties, to consider the importance of industry as compared with fishery interests, and not hastily to judge the often exaggerated complaints of the latter.

Manchester and District Junior Gas Association.—Next Wednesday afternoon, Feb. 6, there is to be a visit to the Burnage Works, Didsbury, Manchester, of Messrs. Hans Renold, Ltd., where much interesting plant will be available for inspection. After tea with the firm, Mr. H. P. Lupton, B.Sc., A.I.C. (Liverpool), will read a paper entitled "Naphthalene." This i :published on p. 262 of this week's "JOURNAL."

REWARDING CONSUMERS FOR APPROVED APPLIANCES.

[COMMUNICATED.]

The editorial on the above subject, which appeared in the "JOURNAL" for Jan. 16, and the Macclesfield system that evoked it, embody the basis of an undertaking having possibilities that hitherto have never been contemplated by any individual or body connected with the gas industry. It matters little whether the ideas already introduced at Macclesfield warranted the editorial concerned or not. The writer of the article is to be congratulated on his imagination quite as much as the author of the system. Mr. Francis W. Belton, in his letter in last week's issue, lays little stress on the momentous venture that he has launched in the consumers' interest. It may be well to question whether a suggestion of anything like the value of the present one to the user of gas has ever been offered since gas has been an industry.

The editorial says: "What the Macclesfield Corporation Gas Committee have done is to adopt a sliding-scale of therm charges, with a further reduction of price if the consumer owns gas-appliances approved by the Gas Engineer;" and later on: "We are pleased to see any scheme formulated which will act as an incentive to consumers to possess suitable appliances."

It is already apparent that Mr. Belton, through diffidence or modesty, will not admit that he realizes what the new era which he introduces with so little preface will mean in practical benefits. The advantage to those on whom our industry depends—consumers—is unquestionable. That every gas undertaking in the land will have to follow such a lead in some form or other goes without saying.

The foregoing is but an earnest of a very real appreciation of the idea. Questions will doubtless crop up every day in regard to its application, until it is shaken down to good and solid principles. One of the first matters of importance is—what is to be considered an approved appliance? There is no need to question the ability of Mr. Belton to draw up a specification for his guidance and that of his officials. Probably he has already done this. (If so, the sooner it sees the light of day the better. Mr. Belton may rely on having the warm support of every right-thinking gas man.) Even so it is obvious that there must be degrees of approval in regard to appliances. Take, as an example, the question of gas-fires and radiators—fires fixed with flues, heaters fixed without them. A gas-fire may be of the most modern construction on the market, or it may be a fire that has been in use for twenty years, and which, with the best will in the world, could not be approved of in the first degree. The same may be said of radiators or heaters without flues.

Apart from the degree of approval of the appliance, what is to be said about the manner in which it is fixed, and the conditions under which it is used? A modern fire badly fixed may give considerably worse results than an indifferent fire well fixed. Take geysers and water heaters of all sorts fixed in small bathrooms. What responsibility is the gas department to take in regard to these? There is a matter of equal importance—what constitutes correct fixing and safe working conditions? The appliances have first to be approved by the engineer, and valid reasons will have to be given by him for turning down any not approved of. It is submitted that such appliances as gas fires, cookers, water heaters, &c., will require to be put into different categories in accordance with the degree in which they meet the approval of the engineer. Probably it will be found that the different appliances will be classed under "A," "B," "C," &c.; and in each class a sub-division will take place into grades. "Safety first" will doubtless be an overriding principle, in regard to the appliance itself, the method of fixing it, and the place and circumstances in which it is used. Gas-fires do not vary very much in efficiency when tested out of position, but they vary considerably when fixed in position in regard to safe and satisfactory service. Gas-cookers probably vary in service more than any other appliances on the market to-day. It is believed that some makers have claimed a saving of 50 p.ct. in gas consumption on the old type; and probably this is not an exaggeration. It has been argued that gas-cookers of the pattern which consume 50 p.ct. more than the modern type are still being sold. Gas undertakings buy many different kinds of cookers and probably these give very different results in economy of service and utility. Therefore it would appear that Mr. Belton could only put the highest and most economical type into category "A," grade 1. Any others approved would come into a different category. If a consumer buys a cooker that consumes 50 p.ct. more gas than another, is the engineer going to approve of such an appliance because it consumes twice the gas necessary, or is he going to prohibit it under his scheme? It is true that if the consumer uses such a cooker he should have gas as cheap as possible, because of the excessive quantity he uses. But all the inferences to be drawn from the editorial in the "JOURNAL," and from Mr. Belton's ideas, are to the one end of giving the consumer the best service possible. Surely the best service must embrace the greatest safety together with the highest economy. If it is right to draw the inferences that are covered by these remarks, the proposal will be seen to embrace most drastic changes in the arts at present practised by buyers of gas-appliances throughout the country. The stamp of approval in the first degree will only

be given to performance, and not because of the promise accompanying name inscription.

There is yet another aspect to this idea of rewarding consumers who use approved appliances, and use them well. If the engineer seeks to give all his consumers first-class gas-apparatus, and assists consumers to scrap the inferior, he may considerably reduce (in some cases by 50 p.ct.) the gas formerly used in the inferior appliances; and, in addition to this, the consumer will be entitled to gas at a reduced charge per therm. It is well known that the kind of appliance in which gas is used is of more importance from the technical standpoint than the price of gas itself. Gas at 1s. per therm used in an old appliance may be as costly to the consumer as gas at 2s. per therm used in an economical one.

Parliament enacts that the quality of gas shall be tested for its calorific value in a costly instrument in constant operation, by which a fraction of 1 p.ct. variation may be recorded. Yet, consumers are provided with appliances—often by the gas authority—which take 10 to 15 p.ct. more gas than they need. Thus the standard price provided to protect the consumer, in so far as the rate he is charged for a given quantity of gas is concerned, does not operate on the appliance. What the consumer requires under the proposed régime is a given size and type of cooking vessel with which he can check the economy and service of the appliance he uses. It would help matters if gas-apparatus manufacturers were to give a guaranteed result for a specific test. Indeed, with every cooker a kettle of definite kind should be supplied as a standard, and in which a quart of water could be boiled in a specified time with a given fraction of a therm. There is nothing difficult about this, and it would be of immense help to buyers connected with gas undertakings, and certainly to gas consumers. The same principle might be applied to gas engines, fires, ovens, geysers, &c.

Certain it is that gas consumers throughout the country will welcome the application of Mr. Belton's ideas so soon as they can be put into operation. The specification to be published, as referred to in Mr. Belton's letters, setting out the powers to specify "fittings" to be used by consumers, is awaited with great eagerness.

PULVERIZED AND COLLOIDAL FUEL.*

There have been great developments during the last few years in the use of pulverized fuel in America and on the Continent, and the matter is now arousing considerable interest in this country. The appearance of Dr. Dunn's book is therefore timely, as it sets out clearly the principles underlying the use of fuel in this form, the advantages and difficulties, and how the latter can be overcome.

As stated in the preface, "the book is primarily an exposition of principles, and does not pretend to describe every form of plant on the market for preparing and utilizing powdered coal." The plan of the work is to consider first the general principles underlying the use of fuel; and it distinguishes carefully between economy in the sense of utilizing the maximum percentage of the heat theoretically available in the fuel—*i.e.*, high efficiency in the technical sense—and industrial or commercial economy in the sense of obtaining the desired result at the minimum cost. It is frequently the case that a plant or process which is most economical in the first sense of the word is by no means the most economical in the second.

The author then proceeds to discuss separately the various processes involved—namely, crushing, grinding, drying, transport, and burning—and brings out clearly that there is no "best" design of plant; the suitability and economy of the various systems depend on the purpose for which the heat is required and the characteristics of the coal it is desired to use. Finally, he considers various applications, and costs.

The advantages of pulverized fuel are the completeness of combustion easily obtainable, combined with great ease of regulation, low labour and stand-by losses, and the possibility of using classes of coal which, owing to high ash content or for other reasons, are not suitable for burning over grates in the ordinary way. These advantages are undoubted, but the individual circumstances must be considered before it can be decided in any particular case whether the use of fuel in the pulverized form is likely to be advantageous, and, if so, which system is the best.

The portion of the book dealing with colloidal fuel occupies only about one-tenth of the whole, but explains clearly what is meant by the term, and the sort of conditions under which it is of value. The work is well written, illustrated, and printed, and should be of great value to those interested in summing-up the somewhat partisan discussions on the merits of individual systems or installations which appear from time to time. For details of particular methods, the reader is referred to Mr. Harvey's report to the Fuel Research Board on Pulverized Coal Systems in America, and other works, which are quoted by the author.

* "Pulverized and Colloidal Fuel," by J. T. Dunn, D.Sc., F.I.C. London: Ernest Benn, Ltd.; 1924. Price, 25s. net.

Midland Junior Gas Association.—A visit has been arranged for next Saturday afternoon to the works of the Sutherland Meter Company, Ltd., at Electric Avenue, Witton, Birmingham. Members are to assemble outside the works at 2.45.

GAS LIGHT AND COKE COMPANY.

Annual Report and Accounts.

THE following is the report of the Directors of the Gas Light and Coke Company for the year ended Dec. 31, which will be presented at the Ordinary General Meeting next Friday.

The accounts for the year show that, after paying, in respect of the June half-year, dividends at the rate of 4 p.ct. per annum on the 4 p.ct. preference stock, 3½ p.ct. per annum on the 3½ p.ct. maximum stock, and £5 4s. p.ct. per annum on the ordinary stock, and after contributing the sum of £20,000 to the redemption fund, there is a total available balance of £825,122 19s. 11d., out of which the Directors recommend the payment of the following dividends in respect of the December half-year: On the 4 p.ct. preference stock, at the rate of 4 p.ct. per annum; on the 3½ p.ct. maximum stock, at the rate of 3½ p.ct. per annum; and on the ordinary stock, at the rate of £5 6s. 8d. p.ct. per annum; which, together with an amount of £11,002 0s. 7d. (equal to 2s. 8d. p.ct. per annum on the ordinary stock) to be carried to the reserve fund, and a further sum of £20,000 to be contributed to the redemption fund, will absorb £597,827 18s. 7d., and leave £227,295 1s. 4d. to be carried forward to the credit of the current year.

The selling price of the Company's gas was reduced from 10d. per therm (4s. 2d. per 1000 c.ft.) to 9·2d. per therm (3s. 10d. per 1000 c.ft.) from the reading of the meter indices for the March quarter, 1923, and was further reduced to 8·6d. per therm (3s. 7d. per 1000 c.ft.) from the reading of the meter indices for the June quarter, 1923, a reduction of 14 p.ct. during the year.

The Departmental Committee of the Board of Trade to inquire into the method of charging for gas on a thermal basis presented their report on Feb. 19, 1923, recommending that the method of charging for gas on the therm basis should be continued and extended to all statutory gas undertakings within the scope of the Gas Regulation Act. The Committee also made other recommendations to help to familiarize consumers with the therm method of charging, which have been put into practice in the Company's district.

The London County Council gave notice in August of their intention to apply to the Board of Trade for a revision of the Company's standard price, under sub-section 3 of section 1 of the Gas Regulation Act, 1920. The Board of Trade held a public inquiry into the matter on Nov. 14 last, and issued an Order, dated Dec. 22, 1923, reducing the Company's standard price as from Dec. 31, 1923, from 15·2d. to 11d. per therm.

The sale of gas shows an increase of 5 p.ct. There has been an addition for the year to the Company's consumers of 11,290, and an increase of 67,253 in the number of gas-stoves sold and let out on hire.

DAVID MILNE WATSON, *Governor.*

Horseferry Road, Westminster, S.W. 1,
Jan. 26, 1924.

The Accounts.

The statement of capital (stock) sets forth that the total paid-up is £10,588,420; added on conversion, £12,941,066—total amount authorized, £23,529,480. Deducting the amount redeemed, £364,200, the total amount of the Company's existing capital powers is £23,165,280. The statement of loan capital stands thus: Total paid-up, £3,294,160; added on conversion, £1,639,770; **remaining** unissued, £750,000—total amount authorized, £5,683,930.

CAPITAL ACCOUNT.

The capital account shows receipts (with premiums, £1,707,183) to the amount of £29,806,393. The expenditure is shown in the following items:

	Expended this Year.	Total to Dec. 31, 1923.
Expenditure to Dec. 31, 1922		£15,213,285 6 9
Expenditure during the year to Dec. 31, 1923—		
Land acquired, including law charges	£32,531 15 0	
Buildings and machinery in extension of works	2,785 14 9	
New and additional mains and service-pipes	73,667 3 10	
Do. do. meters	66,311 15 3	
Do. do. stoves	139,461 10 1	
		314,757 18 11
		£15,528,043 5 8
By amount written off plant	£84,000 0 0	
„ depreciation of stoves	52,260 0 0	
		136,260 0 0
Total expenditure		£15,391,783 5 8
Nominal amount added on conversion		14,580,830 0 0
		£29,972,613 5 8
Deduct amount of capital redeemed under the Gas Light and Coke Company's Act, 1903—		
Per previous account	£321,125 0 0	
This year	43,075 0 0	
		364,200 0 0
		£29,608,413 5 8
Balance of capital account		197,979 19 0
		£29,806,393 4 8

REVENUE ACCOUNT.

Revenue.

Year, 1922.		£ s. d.	£ s. d.
£7,328,778	Sale of gas— Per meter at 10·0d., 9·2d., and 8·6d. per therm	6,087,887 12 10	
235,580	Public lighting and under contracts.	193,505 5 6	
7,564,358			6,281,392 18 4
182,015	Rental of meters	..	220,756 12 8
222,433	Rental of stoves	..	252,863 8 11
323,682	Rental of fittings	..	343,549 13 9
	Residual products—		
1,385,879	Coke, less labour, &c.	1,594,373 18 3	
105,201	Breeze, less ,, ,,	92,186 1 2	
276,080	Tar and tar products	508,376 14 1	
131,474	Ammoniacal liquor and sulphate of ammonia.	209,551 0 6	
1,898,633			2,404,487 14 0
26,116	Rents receivable		19,850 16 3
850	Transfer fees		679 6 0
10,208,089			9,523,580 9 11

Expenditure.

Year, 1922.		£ s. d.	£ s. d.
£3,180,014	Manufacture of gas— Coal, including all expenses thereon	2,974,526 14 9	
208,039	Oil ,, ,, less value of oil tar	154,380 12 8	
338,018	Coke, &c., used in the manufacture of carburetted, &c., water gas	295,123 2 9	
73,512	Salaries of engineers and other officers at works	76,040 2 5	
396,090	Wages	337,352 16 5	
61,967	Purification	45,793 9 11	
1,700,073	Repair and maintenance of works and plant, less received for old materials, £22,284 1s. 11d.	1,581,066 3 11	
			5,463 783 2 10
317,745	Distribution of gas— Salaries and wages (including rental clerks) and cost of pumping	336,501 13 2	
459,357	Repair and maintenance of mains and service-pipes, &c.	464,620 14 8	
236,969	Repair and renewal of meters	241,561 6 1	
354,061	,, ,, stoves	386,262 19 1	
47,070	Fitting up automatic meter supplies	68,949 15 5	
			1,497,996 8 5
125,271	Public lamps—lighting and repairing	..	113,111 16 9
	Rents, rates, and taxes—		
18,573	Rents payable	18,254 0 10	
561,477	Rates and taxes	507,524 14 4	
			525,778 15 2
	Management—		
9,800	Directors' allowance	10,000 0 0	
679	Company's Auditors.	600 0 0	
47,291	Salaries of management staff	48,492 17 2	
142,472	Collectors and cashiers	133,759 7 0	
32,822	Stationery and printing.	38,160 8 11	
45,743	General charges	53,986 15 3	
			284,999 8 4
57,115	Co-partnership	..	63,666 2 10
933	Parliamentary charges	..	353 2 0
1,374	Law charges	..	1,482 0 4
..	Rating charges	..	658 6 4
11,791	Bad debts	..	10,845 1 5
1,000	Depreciation fund for works on leasehold lands	..	1,000 0 0
118,790	Annuities and contributions to superannuation funds	..	122,393 19 6
9,310	Workmen's compensation	..	8,891 12 1
	Contribution under National Insurance Acts	..	43,120 15 7
42,149	Expenses *re* Ilford Amalgamation	..	..
49,189	Public officers, &c.— Contributions under Gas Regulation Act, 1920, and Official Auditor	5,286 1 9	
4,953	Public testing-stations	1,403 5 2	6,689 6 11
2,340			
8,655,987			8,144,769 18 6
1,552,102	Balance carried to net revenue account		1,378,810 11 5
10,208,089			9,523,580 9 11

Total Wages Paid 1923, £2,172,372. Total Salaries Paid 1923, £492,625.

NET REVENUE ACCOUNT.

The total of the net revenue account is £1,623,165. The following statement shows how it is appropriated:

Year 1922.		£ s. d.	£ s. d.
£159,012	.. Interest on debenture stocks and bonds for the year		£159,007 18 0
50 000	.. Amount carried to Special Purposes Fund		..
71,913	.. Interest on temporary loans and sundry funds, less credits		63,210 19 4
	Dividend, &c., for the half year to June 30, 1923:		
81,245	.. Dividend on the 4 p.ct. consolidated preference stock, £81,244 14s.		
45 500	.. Dividend on the 3½ p.ct. maximum stock, £45,500		
20,000	.. Contribution to redemption fund, £20,000		
£5 4s. od. per cent.	.. Dividend on the ordinary stock (£5 4s. p.ct. per annum), £423,079 3s. 5d.		
439,480			
576,225			575 823 17 5
843.360	.. Balance applicable to redemption fund and to dividends, December half-year, 1923		825,122 19 11
£1,700,510			£1,623,165 14 8

Proposed Appropriation of Balance on Net Revenue Account, Dec 31, 1923

Year 1922.		£ s. d.	£ s. d.
£813,360	Balance	..	825 122 19 11
	Amount required for dividends, &c., for the half year to Dec. 31, 1923:		
£81 245	Dividend on the 4 p.ct. consolidated preference stock	81,244 14 0	
45,500	Dividend on the 3½ p.ct maximum stock	45,500 0 0	
20,000	Contribution to redemption fund	20,000 0 0	
22 061	,, reserve fund	11 .02 0 7	
£5 4s. od. p.ct	Dividend on the ordinary stock, £5 6s. 8d. p.ct. per annum on		
£430,199	£16,503,045	440,081 4 0	
£599,005			597,827 18 7
£244,355	Balance carried to next year's account	..	£ 27,295 1 4

The four statements relating to the redemption, reserve, special purposes, and depreciation funds stood as follows on Dec. 31: Redemption fund, £20,000; reserve fund, £118,977; special purposes fund, £471,002; depreciation fund, £109,881.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the year as follows: Coal, £357,057; gas oil, £82,566; coke, £40,314, tar and ammoniacal liquor and products, £203,211; sundry stores, £629,985. The figures at the end of 1922 were: Coal, £328,197; gas oil, £75,478; coke, £34,199; tar and ammoniacal liquor and products, £120,102; sundry stores, £724,812.

Statement of Coal.

—	In Store Dec. 31, 1922.	Received during Year.	Carbonized during Year.	Used during Year.	In Store Dec. 31, 1923.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coal	233,039	2,064,607	2,055,117*	3161	239,368

* In addition to this quantity of coal, 10,789,431 gallons of oil have been used during the year.

Statement of Residual Products.

Description.	In Store Dec. 31, 1922.	Made during Year.	Used during Year.	Sold during Year.	In Store Dec. 31, 1923.
Coke—tons	34,199	1,321,944	219,833	1,101,254	35,056
Breeze—tons	7,953	203,216	32,527	156,834	21,808
Tar, from coal only—galls.	3,041,034	19,073,589	19,954,635	19,439	2,140,549
Ammoniacal liquor—butts	29,676	553,764	551,720	..	31,720

Statement of Gas Made, Sold, &c.

		Quantity Made.	Quantity Sold. Public Lights and Under Contracts (Estimated).	Quantity Sold. Private Lights (per Meter).	Quantity Sold. Total Quantity Sold.	Quantity Used on Works, &c.	Total Quantity Accounted for.	Quantity Not Accounted for.	Number of Public Lamps.
1923.	Cubic feet (thousands) †	76,570,919	858,407	32,553,548	33,411,955	525,722	33,937,677	2,633,242	42,831
	Therms §	12,542,483	4,307,912	163,378,386	167,686,298 *(167,059,775)	2,638,546	170,324,844	13,217,639	..
1922.	Cubic feet (thousands). †	35,778,174	861,291	31,731,926	32,593,217	548,801	33,142,018	2,636,156	44,252
	Therms §	175,698,318	4,257,499	155,839,825	160,077,324	2,693,458	162,770,782	12,927,536	..

* At declared calorific value—viz., 500 B.Th.U. per cubic foot.
† Including 10,020,104 thousands of carburetted, &c., water gas.
§ At actual calorific value—viz., 502 B.Th.U. per cubic foot.

Large Scale Catering.—In the current issue (No. 119) of the British Commercial Gas Association's "A Thousand-and-One Uses for Gas," it is stated that a large number of hotels, boarding houses, restaurants, and business premises in Bournemouth do their cooking and water-heating entirely by gas, while of the remainder there is probably not one which has not in use a fair proportion of gas-appliances of one sort or another. The magazine contains illustrations of many of the best-equipped kitchens in the Bournemouth catering establishments, as well as of others in works and office canteens in industrial centres. It is a publication which should be in the possession of every member of the catering trade.

THE ILLUMINATING ENGINEERING SOCIETY.

Co-ordination of Research.

A meeting of the Society was held at the Royal Society of Arts on Jan. 22, when Mr. J. S. Dow opened a discussion on "Co-ordination of Research in Illuminating Engineering, and Some Practical Examples." Mr. D. R. Wilson was in the chair, and the attendance, considering the great inconvenience caused by the railway strike, was encouraging. The paper presented by Mr. Dow is a lengthy one, and because of this the author gave a résumé—a difficult task, for the paper itself could well be regarded as a summary. The subject matter throughout is of such interest that we propose to select extracts from the paper which gave rise to discussion.

RESEARCH ON PHOTOMETRY AND STANDARDS OF LIGHT.

It is now recognized that lighting units are best compared in terms of mean spherical and mean lower hemispherical candle-power. Hence the integrating sphere, enabling mean spherical candle-power to be determined by a single measurement, is an apparatus of considerable value. Recent experiments suggest that a cubical box with whitened interior—a much more simple apparatus to construct—answers sufficiently well for sources having approximately the same polar curve; and the "lumen-comparator" devised by Prof. J. T. M'Gregor Morris utilizes a double box of this kind. The sphere photometer appears to have been found preferable to apparatus using a series of mirrors. However, Sabulka has recently substituted a series of matt white surfaces, the diffused light from all of which falls on the photometer, enabling mean spherical candle-power to be obtained with a single measurement. In a later design a continuous surface in the form of a rectangle is substituted. Existing instruments, though extremely useful, are not perfect. Greater simplicity, without undue sacrifice of accuracy, is needed. At present we are dependent on the use of a small glow lamp supplied by a dry cell or accumulator, the decline in voltage of which is a drawback. Most people now agree that instruments should be provided with a voltmeter or ammeter and a rheostat, to enable determination in voltage to be recognized and corrected. Lead batteries come to grief if neglected, and it is possible that the new nickel-iron types may prove useful. There seems to be room for two distinct forms of instruments, one of the highest possible accuracy, complete with all details, and yet portable for accurate work, and with a wide range suitable alike for use in streets, indoor installations, and general research work; second, a more approximate but extremely simple form serving to give a general idea of the order of illumination prevailing. In everyday work we are concerned with a limited number of well-defined steps in illumination. A simple instrument, for instance, with a series of slots of graded brightness corresponding to these main steps, which could be read by inspection without a telescope and manipulation to obtain balance, should serve to popularize measurements, and should enjoy a wide demand.

Much research has been done on photo-electric cells; and it may be that ultimately this will go far towards solving the problem of obtaining a simple photometer for general use. Such cells have been used for purposes such as automatically recording fluctuations in daylight, in "television," and as an element in apparatus for synchronizing a kinema picture-film with a record of sound. The photo-electric cell prepared by Dr. Chase in the United States is stated to exhibit sensitiveness throughout the spectrum similar to that of the human eye, and to give a response directly proportional to intensity of light. It may eventually be applied in a portable instrument which would give a reading on a dial when presented towards a source of light; the instrument being calibrated in the laboratory, so that the eye of the user would be relieved of the process of making a photometric balance, which presents difficulties to those unfamiliar with photometry.

Another problem, partly photometric, is the devising of a simple instrument for the measurement of glare. The effect of glare or dazzle depends on many factors, but it is accepted that the brightness of the source is one of the most important items. As a knowledge of brightness also enters into other aspects of lighting, a simple form of instrument to enable this quantity to be quickly and easily determined would be very useful. It may be, however, that this alone would not suffice, and that some tests based on the actual physiological effect of glare may also be needed.

RESEARCH ON GLARE.

The term "dazzle" or "glare" covers several distinct effects, such as the discomfort to the eye when exposed to excess of light, the diminution in visual acuity owing to bright lights in the field of view, and the effects of sources seen "out of the tail of the eye," or of light directly reflected into the eye. The problem is complicated by the differences between individual eyes, and the state of adaptation of the eye considered. A person emerging from a dark room, or in an unlighted country lane, is dazzled even by a mild brightness. On the other hand, bright lights are apt to be much less distressing if the surroundings are also bright. One is therefore led to appreciate the value of contrast. A good illustration is to be found in the kinema; most people now agree that vision is more comfortable if there is subdued general illumination in the room while the film is being shown, so that the eye is not troubled by the severe contrast between the brightly-lighted screen and the darkened auditorium. There is a general recognition that much remains to be done from the physiological side in order to devise rules and regulations in regard to glare. At present our methods are largely empirical. They are based on the common knowledge that lights in the direct range of vision are distracting to the eye, that the effect becomes less severe as the sources are raised so that the angle at which the rays strike the eye becomes greater from the horizontal. This is the guiding consideration in the recommendations drafted by the Home Office Departmental Committee on Lighting in Factories and Workshops. It has likewise been assumed that a source so shaded that its brightness is not more than 5 candles per sq. in. is not unduly glaring, and may be used in the direct range of view. However, some authorities have urged that we should not be guided only by brightness, but that the total candle-power is also an important factor.

The problem of the intensity of illumination requisite for various purposes calls for joint effort on the part of several experts. It may be that the standard of lighting demanded is affected to some extent by climatic conditions. For working purposes the guiding consideration is the illumination necessary to see with ease what one is doing and to perform operations as efficiently as possible. In practice, people strike a balance between what they think they can afford to pay and the benefits they receive from improved illumination. It has often been pointed out that expenditure on lighting forms only a small percentage—something less than 1 p.ct.—of the wages bill, and that therefore managers of factories can afford to take a broad view; but an increase very much above what has hitherto been considered good practice requires justification.

Comparisons are often made between the researches conducted in the United States and this country. It is overlooked that in America there are well-equipped laboratories, supported by manufacturing concerns, with a staff of workers engaged solely in carrying out experiments on illumination. In England those interested in illumination have other occupations; and one can only marvel that so much voluntary effort has been devoted to research of a kind that promises no pecuniary return.

POINTS FROM THE DISCUSSION.

Major K. Edgcumbe thoroughly agreed with the author in that lighting units were best compared in terms of mean spherical candle power, and considered that the integrating sphere was of great practical value. Simplicity should be their aim. Mr. Dow had suggested that a simple instrument having a series of slots of graded brightness, which could be read by inspection without a telescope, would find a wide demand. There was no question that the elimination of the telescope, whereby different observers obtained different results, was called for; but the need for obviating manipulation of the balance was of less importance. Regarding the degree of accuracy attainable by the use of photometers, under the very best conditions there was a margin of error of 1 p.ct., and in normal working circumstances one of about 4 p.ct.

Several interesting observations were made by Mr. J. W. T. Walsh, who remarked that he had a distrust of diffusing surfaces, in which direction there was a wide scope for investigation and research. From his own experiments he had found that errors between 20 and 30 p.ct. of the true value crept in when the diffusion photometer was used at an angle of more than 40° from the normal. He could not share Mr. Gaster's enthusiasm for the photo-electric cell, which was stated to exhibit sensitiveness similar to that of the human eye, and to give a response directly proportional to intensity of light. All such cells which he had examined had, in comparison with the human eye, very low sensitivity curves, on which, moreover, full reliance could not be placed. Indeed, what appeared to be identical photo-electric cells, carefully constructed to attain this end, exhibited marked divergencies.

Mr. A. Cunnington remarked that Mr. Dow had referred to the measurement of brightness by some simple means. In this connection he could not refrain from inquiry as to what should be taken as the standard in the measurement of intrinsic brilliancy. It was not correct to take the projected area of the filament, the thickness of which varied with temperature, and was ten times as large when hot. In the same way, it was not correct to regard a gas-mantle as a solid source of light. It had been suggested that there was so much hirsute effect that it could be well regarded as a solid source; but from microscopical examinations which he had made, no less than two-thirds of the area appeared to be space. This, he suggested, was a suitable subject for research. Efforts had undoubtedly been made by manufacturers. He remembered the time when the problem of light distribution for close spacing for the illumination of railway platforms was considered. At that time Messrs. Sugg brought out a gas-lamp, which, though adequate for the purpose, was not draught-proof. Since then, however, improvements had been made; and the firm were about to place on the market a reflector for outdoor gas-lamps which would ensure the uniform distribution of light on a working plane, without loss in a horizontal direction. There was no doubt that much public-spirited work was being carried out by many firms.

Several other members of the Society joined in the discussion; their remarks, however, centering on topics of greater interest to the Society itself than to readers of the "JOURNAL." Subsequently, after a vote of thanks had been accorded to Mr. Dow, the Chairman announced that the next meeting would be held at the Royal Society of Arts on Feb. 19, when the subject for discussion would be "Some Aspects of Railway Lighting."

GAS ACCOUNTANCY.

By H. E. IBBS, of the Gas Light and Coke Company.

[A Lecture in connection with the School of Accountancy Students' Association, delivered at the Memorial Hall, Farringdon Street, E.C., on Tuesday, Jan. 15.]

Gas accountancy, in its entirety, is such a vast subject, and embodies such a variety of detail, that it is impossible in the time at my disposal to do more than sketch an outline. From the main divisions, innumerable paths open out, the majority of which could easily command a separate lecture. I propose, therefore, to give you what I might describe as the general principles upon which gas accountancy is based; and, to do so, I shall first of all have to sketch briefly for you such of the history of the industry as may have a bearing on the subject, in order that you may understand, for instance, how the present method of paying dividends and obtaining capital has been arrived at.

RETROSPECTIVE.

Some sixty years ago, there existed in the Metropolis a number of gas companies competing with one another. To such an extent was this carried that a great deal of confusion arose, especially in regard to boundaries, and great inconvenience was caused to the public by the frequency with which disturbances to the surface of the pathways and roads had to be made. In numerous cases companies actually received money for gas not supplied by them, and, on the other hand, actually delivered gas for which they made no charge. When the time arrived at which this unsatisfactory state of affairs could no longer be tolerated, steps were taken to establish proper boundaries. For this purpose the Metropolis Gas Act, 1860, was passed; and by successive amalgamations, authorized by later Acts, the thirteen companies supplying the Metropolis in 1860 have been reduced to three.

The Gas-Works Clauses Act which was passed in 1871, in addition to dealing with other matters, defined the form in which gas companies were to present their accounts. The accounts as we have them to this day are in the form prescribed in 1871, allowing, of course, for such necessary corrections and alterations as have had to be made in consequence of the introduction of different methods of gas making from those in force at the time of the Act. It may be mentioned that, under the Gas Regulation Act, 1920, the Board of Trade have power to prescribe the form of accounts, not only in the case of companies, but of municipal undertakings. Up to the present, however, this power has not been exercised. I do not propose to say more on this particular subject for the moment, as I shall be referring later to the accounts that are presented annually to the shareholders of my own Company.

Continuing the historical survey, until 1876 the profits which could be divided in any year were not allowed to exceed 10 p.ct., unless there were arrears on this basis due to be paid in respect of a previous year or years; but when at a later period additional capital was authorized by Parliament, the dividend was usually limited to 7 p.ct. Since 1876, whenever an occasion has presented itself—such, for instance, as the obtaining of parliamentary sanction for the raising of additional capital—a method known as the sliding-scale has been introduced, when desired, into Companies' Acts. To this method of regulating dividends I will also refer later.

At this point it is necessary to explain that usually the capital of a gas company is divided into ordinary, preference, and debenture stock. The dividend on the ordinary stock, while remaining subject to any maximum that may be imposed either by a direct Statute or by the provisions of the sliding-scale, is governed, of course, by the profits of the undertaking; but the interest payable upon the preference and debenture stocks is a fixed charge, and must, as is customary in all commercial undertakings, be dealt with before any consideration can be given to the dividend to be distributed to the ordinary shareholders.

The payment of a 10 p.ct. dividend fifty or sixty years ago did not apparently satisfy shareholders in all gas companies, and it was found that capital was being issued to shareholders in several undertakings at the nominal value of the stock only—*i.e.*, £100 cash was being paid for a nominal £100 of stock, instead of the price which, had the stock been issued at its market value, it would have fetched above the nominal value of £100. (It must be remembered that 10 p.ct. as a dividend was becoming more and more attractive, owing to the increasing security of gas company stocks.) To deal with this state of affairs, a Standing Order of the House of Commons appeared in the session of 1877 requiring provision to be made, in every Bill introduced into Parliament for the purpose of obtaining additional capital powers, for such capital to be offered by public auction or tender, so that the best price obtainable should be secured.

The majority of gas companies are statutory—*i.e.*, they work under an Act of Parliament—and therefore such capital as is issued by them must be in accordance with the special provisions contained in their particular Acts. While very many companies have their dividends regulated by the sliding-scale, there are a large number still who are allowed to pay up to a fixed maximum dividend, and these companies are described as maximum companies.

THE SLIDING-SCALE.

The method of paying dividends according to a sliding-scale is gradually finding its way into the scheme of working of all the important gas companies in the country. The sliding-scale may be briefly explained as follows: The dividend which the company were accustomed to pay—say, 10 p.ct.—was first of all fixed as the standard dividend, and a price for gas was agreed upon at which it was considered this standard dividend should be paid. In the early days the selling price at the time was usually adopted as the standard price. Then the sliding-scale was added to this arrangement and allowed an increase of (say) 5s. p.ct. to the standard dividend for every 1d. per 1000 c.ft. reduction from the standard price, but imposed a reduction of 5s. p.ct. from the standard dividend for every 1d. per 1000 c.ft. increase above the standard price.

If you will glance at Statement No. 1, you will find set out the working of a sliding-scale. There you will see the standard price has been fixed at 3s. 6d. per 1000 c.ft. and the standard dividend at 5 p.ct.—each penny above or below the standard price altering the authorized dividend by 2s. 6d. p.ct.

STATEMENT No. I.—*Sliding-Scale for Dividend on Ordinary Stock.*

	Price of Gas per 1000 C.Ft.		Rate of Dividend. P.Ct.
	s. d.		£ s. d.
	3 9	..	4 12 6
	3 8	..	4 15 0
	3 7	..	4 17 6
Standard price and standard dividend	3 6	..	5 0 0
	3 5	..	5 2 6
	3 4	..	5 5 0
	3 3	..	5 7 6

Naturally the idea of this was to give the companies concerned an incentive in making the price of gas as low as possible, and to induce them to use such efforts as would prevent the price of gas from advancing above the standard. The 10 p.ct. standard dividend and the 5s. p.ct. slide for each penny variation from the standard price are now rarely met with, as so many companies have converted their capital to a basis of 4 or 5 p.ct. The 10 p.ct. standard ruled, however, for a great number of years. As money became cheaper, a dividend of 10 p.ct. or so became more and more attractive, as I have already pointed out, and investors were willing to give £200 or so for a nominal £100 of stock on which such a dividend was being paid. Therefore, as such investors were in reality only obtaining a dividend of 5 p.ct. or thereabouts, and in order to place the matter in its right perspective with the public, some gas companies converted their stocks to such nominal amounts as would allow of their dividends being stated at a more reasonable rate per cent.

The sliding-scale has been in existence for nearly fifty years, and has abundantly justified the principle upon which it was founded—viz., that of community of interest as between the consumer and the shareholder. The relative benefit of each party from a reduction of 1d. per 1000 c.ft. in the price of gas is, as you will see by reference to Statement No. 2, generally speaking, six or seven to one—or, to put it into money, the consumers of the Gas Light and Coke Company, for example, obtain a benefit of £130,000 per annum by a reduction of 1d. per 1000 c.ft. in the price of gas, whereas the shareholders obtain an increase in dividend of £22,000.

STATEMENT No. II.—*The Sliding-Scale.*

Advantages derived by consumers as compared with shareholders by a reduction of 1d. per 1000 c.ft.

Consumers—
Assume an annual sale of:
31,200,000 thousands at 1d. per 1000 c.ft. = £130,000

Shareholders—
2s. 8d. p.ct. on a capital of (say) £16,550,000 = say) £22,000

Until the war, prices of gas were being steadily reduced, and the shareholder was benefiting proportionately, and there was also no difficulty at any time in obtaining new capital. Then came the war. Very few measures, however beneficial, and however soundly constructed, were able to stand the cataclysm caused by the war; and sliding-scales were no exception, and had to go the way of many other things. They were naturally inadequate to meet a situation in which the price of gas was bounding up with startling rapidity; and in 1918, therefore, an Act called the Temporary Increase of Charges Act had to be passed, to enable companies to pay dividends irrespective of the price of gas, as dividends according to the sliding-scale were rapidly disappearing altogether. The dividends allowed by this Act were not to the extent normally enjoyed by the shareholders. Being a temporary measure only (as its name implies), further steps had to be taken by Parliament as soon as the war was over. In 1920 a measure of a permanent character entitled the Gas Regulation Act received parliamentary approval. This measure not only resuscitated the sliding-scale, but decreed that gas should no longer be sold by its cubical capacity, but by its heat value. The method, therefore, of stating the gas supplied to a consumer in terms of cubic feet has been superseded, and we now get a basis known as the therm.

THE BRITISH THERMAL UNIT.

Before explaining the therm, I must tell you what is meant by the heating value of gas. For very many years, a term, the "British Thermal Unit," has existed. Briefly, it is the amount of heat required to raise 1 lb. of water 1° Fahr., as you will see by reference to Statement No. III. Now 3411 of these heat units com-

STATEMENT No. III.—*The Therm.*

(1) A British Thermal Unit (B.Th.U.) is the amount of heat required to raise the temperature of 1 lb. of water 1° Fahr.
(2) A therm is 100,000 B.Th.U.
(3) To ascertain the number of therms used, the number of cubic feet registered by the meter should be multiplied by the calorific value of the gas the company undertake to supply (say, 500 B.Th.U.) and divided by 100,000. For example:

8000 c.ft. × 500 = 4,000,000
which, divided by 100,000 = 40 therms.

It will therefore be seen that—

1000 c.ft. of 550 B.Th.U. gas = 5½ therms
1000 ,, 500 ,, ,, = 5 ,,
1000 ,, 475 ,, ,, = 4¾ ,,
1000 ,, 450 ,, ,, = 4½ ,,

prise the Board of Trade Unit used in connection with electricity. A unit of electricity is, as you may know, sold at varying prices from 1d. to even 8d. This number of heat units in the case of the gas industry was too small a measure to fix a price upon, and it was decided to adopt 100,000 B.Th.U. (or nearly thirty times that of the unit of electricity); and this quantity is called the "therm."

You will wonder what relationship there is between a therm and a number (say) of cubic feet. There is no definite relationship for all and every purpose, as it depends entirely on the quality of the gas. A cubic foot of gas may contain anything from (say) 180 to 800 potential heat units. A cubic foot of ordinary coal gas will contain about 550 B.Th.U., and water gas, which is manufactured by heating coke to incandescence and then introducing water in the shape of steam, will contain from 280 to 300 B.Th.U. A mixture of two such gases in due proportions will give a gas of 500 B.Th.U., which may be considered as fairly representing the calorific value of the gas supplied generally throughout the country. Statement No. IV. deals with this. Variations exist to the extent of 50 B.Th.U. or more both below and above this figure.

STATEMENT No. IV.—*Mixed Coal Gas and Water Gas.*

Calorific value of coal gas . . . 550 B.Th.U. per c.ft.
,, ,, water gas . . . 280 ,, ,, ,,

Coal gas . . . . . 81½ p.ct. of the total gas.
Water gas . . . . . 18½ ,, ,, ,, ,,
100

81½ p.ct. × 550 = 448·25
18½ ,, × 280 = 51·80
100 = 500·05 B.Th.U. per c.ft.

Taking what is called a 500 B.Th.U. gas, therefore, it will be seen (Statement No. III.) that in 1000 c.ft. there would be 500,000 B.Th.U., and as a therm is 100,000 B.Th.U, 1000 c.ft. would be equal to 5 therms. In the case of a 550 B.Th.U. gas, 1000 c.ft. would contain 550,000 B.Th.U., or 5½ therms. You will see, therefore, that, although the same price might have been charged for the two quantities of 1000 c.ft., the actual value received would have differed; and unless a consumer were aware of this point, he would have imagined that there was no difference in effect so far as cost went.

I will now show you how the old prices per 1000 c.ft. (Statement No. V.) were converted into equivalent prices per therm. Taking

STATEMENT No. V.—*Prices per 1000 C.Ft. converted to equivalent Prices per Therm.*

(1) Price of gas . . . . . 5s. 6d. per 1000 c.ft.
Calorific value . . . . . 475 B.Th.U. per c.ft.
Therm . . . . . 100,000 B.Th.U.

$\frac{66 \times 100{,}000}{475 \times 1000}$ = (say) 14d. per therm.

or 66d. ÷ 4¾ therms* = (say) 14d. ,, ,,

* See Statement No. III.

(2) Price of gas . . . . . 5s. 5d. per 1000 c.ft.
Calorific value . . . . . 500 B.Th.U. per c.ft.
Therm . . . . . 100,000 B.Th.U.

$\frac{65 \times 100{,}000}{500 \times 1000}$ = 13d. per therm.

or 65d. ÷ 5 therms* = 13d. ,, ,,

* See Statement No. III.

the case of my own Company—the Gas Light and Coke Company—we were charging 5s. 6d. per 1000 c.ft. in 1921, when the change was made. The gas we were supplying had a calorific value of 475 B.Th.U. Therefore in each 1000 c.ft. there were 475,000 B.Th.U., or 4¾ therms. Now, 5s. 6d. divided by 4¾ equals, as nearly as possible, 14d., which was the price charged for the therm. Take another case, that of a company charging 5s. 5d. per 1000 c.ft., and delivering a 500 B.Th.U. gas. In this instance obviously the price per therm would be 1s. 1d. Now, to students like yourselves, it will be seen how impossible it was for the companies to be deceiving the public, as many papers alleged to be the case. What difference, for instance, can there be between charging 50,000 c.ft. at 5s. 5d. per 1000 c.ft. and 250 therms at 1s. 1d.?

Undoubtedly the reason why there was so much agitation a short time ago over the therm was because the public did not really understand the new system; but no such excuse can be advanced on behalf of the daily papers, representatives of which were specially instructed in the matter, in the way I am now showing you. At the time the therm was introduced by legislation, Parliament dealt, as I have already mentioned, with the sliding-scale, as it was felt to be important that such a beneficent principle should still be adhered to; and it was arranged, therefore, bearing in mind the increased cost of making and distributing gas, to add to each company's original standard price such an amount as represented the increase in cost since 1914. The matter would have been simple, but for the introduction of the therm. The way it was accomplished, however, was as follows:

STATEMENT No. VI.—*Method of Fixing a New Standard Price.*

		Per Therm. d.			Per Therm. d.
Pre-war cost of manufacturing and supplying gas, 20·72d. per 1000 c.ft. (541 B.Th.U.)		3·83	..		3·83
Cost of manufacturing and supplying gas	(1921)	11·43	..	(1924)	7·23
Increase in cost		7·60	..		3·40
Pre-war standard price of 3s. 2d. converted into its therm equivalent (500 B.Th.U.)		7 60	..		7·60
Standard price		*15·20	..		11·00

You will notice that a decimal fraction is used to express this standard price; and as actual selling prices follow suit in this direction all over the kingdom, the use of the decimal marks an innovation in our domestic affairs.

The standard price of 15·2d. carried with it a 4 p.ct. dividend, and as the selling price at that time was 14d., or 1⅕d. below the standard, we were entitled to add 16s. to the standard dividend of 4 p.ct., as 2s. 8d. p.ct. increase is allowed for each ⅕ of a penny below the 15·2d. standard—⅕ of a penny, or 0·2d., being assumed to be the equivalent of the 1d. per 1000 c.ft. (Statement No. VII.).

STATEMENT No. VII.—*Sliding-Scale for Dividend on Ordinary Stock.*

1921-23.	Price of Gas per Therm.		Authorized Rate of Dividend. P.Ct. £ s. d.		Deduction in respect of Redemption Fund P.Ct. s. d.
	d.				
	15·6	..	3 14 8	..	—
	15·4	..	3 17 4	..	—
Standard price and standard dividend	15·2	..	4 0 0	..	—
	15·0	..	4 2 8	..	1 4
	14·8	..	4 5 4	..	1 4
	....	..	.....	..	....
	....	..	.....	..	....
	8·6*	..	8 8 0	..	5 4
1924 (revised).					
	11 4	..	3 14 8	..	—
	11·2	..	3 17 4	..	—
Standard price and standard dividend	11·0	..	4 0 0	..	—
	10·8	..	4 2 8	..	1 4
	10 6	..	4 5 4	..	1 4
	....	..	.....	..	....
	....	..	.....	..	....
	8·6*	..	5 12 0	..	5 4

* Present selling price of gas.

With regard to this matter, not only was there the difficulty of translating the standard price from the cubic-foot basis to the therm basis, but there was also the difficulty of fixing an equivalent to the penny that actuated the slide dividend. With a gas of exactly 500 B.Th.U., the equivalent was, of course, 0·2d., or ⅕ of a penny; but as a 500 B.Th.U. gas was not supplied by every company, it appeared necessary to introduce an adjusting scale involving the use of three or four places of decimals. I am pleased to say, however, that the Board of Trade, under whose jurisdiction the matter came, decided that 0·2 should be regarded as the equivalent of the penny in all cases, irrespective of the calorific value of the gas. Since 1921 the price we charge has been reduced to 8·6d. per therm, which would naturally allow of a dividend beyond what is customary for the Company to pay. The Act contained, however, a provision whereby the standard price could be amended if at any time the cost of manufacture was shown to have decreased. This revision has recently taken place, and as it was shown that the cost of the production of gas had been reduced by 4·2d. per therm since 1921, the standard price was accordingly amended.

(To be concluded.)

Southern Association of Gas Engineers and Managers.—We learn from the Hon. Secretary (Mr. W. H. Bennett) that the annual general meeting of the Association will be held on Wednesday, March 19, 1924, at the Connaught Rooms, Great Queen Street, Kingsway, W.C., at 2.15 p.m. Full agenda will be issued in due course.

CHEMICAL TOPICS FROM CURRENT LITERATURE.

Notes from Recent Technical Publications.

By H. J. HAILSTONE (Rochdale).

IMPROVED LABORATORY APPARATUS.

In the "Transactions" of the Chemical Society, W. Hickman gives several notes of interest to control and research workers. The first item deals with an improved filter pump of the water-jet type, specially designed to give good vacuum with low water pressures. Contrary to the older practice, in which a water jet impels air drawn through a surrounding annular space, the new type allows the air to be drawn through a central jet by a current of water flowing through the annular space. By this means the retarding effect of the walls of the pump is obviated. Some of the defects of water motors used for stirring operations, &c., are eradicated in a simple type of apparatus described in the second note. The moving vane, mounted on a vertical spindle, is immersed in a cylindrical water vessel, the contents of which are kept in rotation by a tangential jet of water. An overflow tube is provided near the open top of the vessel. The construction of such a device should not present the slightest difficulty to the works meter repairer. The third description is concerned with a thermostat system for hot or cold conditions. This comprises an expansion bulb with a special two-way head, by means of which tap water is allowed to enter a supply tank and displace a certain amount of hot or cold water, which then flows through a coil in the thermostatic bath, and corrects any temperature variations.

A "bubbling" bottle for washing gases for the removal of absorbable constituents is described by K. Keller in "Chemiker Zeitung." In this apparatus the washing liquid is contained in a cylinder, and the gas enters the top through a short inlet tube. The outlet tube, provided with a bulb at the top, is continued to the bottom of the vessel, and from the bulb a spiral tube reaches down just below the surface of the liquid. When in action, the gas entering the bottle ascends the spiral outlet tube, and carries plugs of liquid with it, thus ensuring good contact. Separation occurs in the bulb, and the liquid drains back through the straight tube to the bottom of the bottle, while the washed gas passes on. Circulation of the reagent is thus automatic.

ESTIMATION OF CARBON.

A method for the estimation of carbon in fuels is described by E. Goutal in "Fuel." In this method a weighed sample of the coal (in a crucible) is placed in a bomb fitted with inlet and outlet valves for the supply and release of oxygen. Combustion is allowed to proceed at a pressure of twenty atmospheres, and the resulting gases are passed through a measured volume of standard caustic soda. The bomb is finally purged clear with a current of air, in order that the whole of the carbon dioxide resulting from the combustion may be absorbed by the caustic solution. The excess of soda is then titrated back with acid, using phenol phthalein as indicator, and the weight of carbon may then be calculated from the amount of carbonate formed. A blank test should be performed, and results corrected accordingly.

VOLATILE MATTER.

In order to obtain concordant results in estimating volatile matter in coals, the importance of the exact duplication of the conditions under which the test is carried out cannot be overrated. This point has previously been emphasized in these columns, and M. Wirtz, writing in "Fuel," cites a case where a number of different chemists returned results which varied greatly, though the same sample and standard method were used by each. A suggested cause of high results is that of oxidation, which is likely to occur if the crucible lid is loose fitting, though an excessively tight lid tends to confine the vapours, and leads to a certain amount of cracking, giving rise to a low volatile figure. Attention to this apparently unimportant point is therefore very desirable.

LATENT HEAT OF VAPORIZATION.

The Journal of the Institute of Petroleum Technologists publishes a method for determining the latent heat of vaporization of motor fuels. The method is described by Dr. Ormandy and Mr. E. C. Craven, and is equally applicable to benzole and naphthas. A uniform supply of the liquid to a well-lagged steel still is maintained by means of a constant-level device; and on heating the still, the vapours travel through a well-lagged water condenser, and are condensed. Fresh liquid enters the still at the rate of distillation, and, after a time, an equilibrium is reached, when the distillate is identical in composition to the mixture supplied. Thereupon readings may be taken to determine the increase in temperature and the volume of water passing through the condenser during the distillation of a known weight of liquid. In the apparatus used by the authors the results obtained appeared to be about 3 p.ct. low; and this was thought to be due to heat losses from unlagged portions of the apparatus.

VISCOSITY OF TARS.

How the friction error present with certain types of viscosimeters may be compensated for when determining the viscosity of tars and soft pitches is explained by W. J. Huff in "Industrial and Engineering Chemistry." Experimental evidence obtained from a "Stormer" viscosimeter—in which a cylinder, immersed in the sample under test, is rotated by means of a falling adjustable weight—indicated that the friction effect is fairly constant over certain ranges of time-weight ratios; and by conducting tests under suitable conditions the errors due to friction may be very much reduced. Failing this, the degree of such errors must be determined experimentally, and allowed for. A convenient formula is given showing the effect of temperature on the viscosity of tars; but an exact relationship between such factors as free carbon content, specific gravity, chemical composition, and viscosity cannot be accurately stated. Further formulæ are given regarding the flow of tars in pipes; and these are worthy of the attention of tar-works engineers.

HEAT EXCHANGE.

In "Chemical and Metallurgical Engineering" are some notes by Messrs. Hougen and Edwards dealing with the principles underlying the functioning of heat exchangers of the checker-brick type. When transferring heat from one gas to another *via* a solid, the amount of heat absorbed by the solid depends upon the average difference in temperature between the solid and the gases, and upon such factors as the specific gravity, specific heat, porosity, and conductivity of the solid employed. Results based upon an investigation of several different types of brick materials are given, together with the conclusions drawn from their observations.

CORROSION OF METALS.

Results of further work on this subject by Messrs. Thompson and M'Kay are reported in "Industrial and Engineering Chemistry." In their experiments the test samples were kept in motion in the corrosive solution at different temperatures, and the effect of simultaneous treatment with a current of air was noted. The effect of this exposure to air was most significant; and test-plates of alloys were actually corroded right through at the points where the air jet impinged, while adjacent portions had barely been affected by the solution.

"Engineering" records the observations of G. D. Bengough and others on the causes of corrosion in brass condenser tubes. The presence of air bubbles in the water aggravates the trouble, and a mechanical erosive, or scouring, effect is noted. in addition to the customary chemical corrosion.

STORAGE OF VOLATILE LIQUIDS.

Articles that have appeared in "Engineering" are of interest to all concerned with the large-scale storage of volatile liquids such as naphthas, ammonia solutions, &c. The losses due to the "breathing" of tanks while being filled or emptied, or during changes in temperature, may be individually small, but, judging by the attention given to the matter, may become cumulatively large. It is not alone the question of the quantity lost that is of concern, but the consequent quality change due to the evaporation of lighter constituents from the mixtures; this necessitating the addition of further material to bring the quality back to specification. Water spraying of the tanks has been resorted to, so that temperature variations may be minimized; and this has been advantageous. A superior method, however, is that of obviating exposure of the liquid to the air by the use of a floating cover—very much on the lines of the "Nurenberg" gasholder roof. This almost completely fits inside the storage tank, and rises and falls with the liquid upon which it floats. The risk of fire is very much reduced.

NAPHTHALENE AND BENZOLE EXTRACTION.

The practical application of the findings of Dr. Bunte and Pippig in this connection [see "JOURNAL" for Jan. 23, p. 203] was dealt with by the former in a paper read at a meeting at Braunlage, and published in "Das Gas- und Wasserfach," Nos. 33 and 34, 1923. The following is a short abstract.

The benzole scrubber, states Dr. Bunte in his introduction, works on precisely the same principle as the naphthalene scrubber, except that the oil is constantly being renewed, instead of only at intervals. Moreover, it is usually an oil of greater solvent capacity for naphthalene than that used in the naphthalene scrubber. Yet, in spite of this, many works had experienced greater naphthalene troubles after adding benzole scrubbers to their plant than before. The obvious reason for this is that the wash oil, when it meets the gas in the scrubber, is itself not sufficiently free from naphthalene; and Dr. Bunte set himself to apply theory to practice in the Karlsruhe Gas Institute.

For the wash oil to take naphthalene from the gas, it must be such that the vapour pressure of the naphthalene in solution in it is less than that of the naphthalene in the gas which is to be scrubbed. A naphthalene content of 7·5 grammes per 100 cub. m. [about 33 grains per 1000 c.ft.] at 5·° C. [41° Fahr.] is regarded as the maximum of naphthalene that can safely be left in the gas. To keep down to this, the actual naphthalene content of the wash oil must not exceed 10 p.ct.; otherwise, at ordinary working temperatures, the oil will give up naphthalene to the gas. In preparing the wash oil, as delivered, to conform to this condition, it was found that a cooling process, even to 0° C., did not always eliminate sufficient naphthalene. It is much safer to introduce the fresh oil to the system not direct into the scrubber, but between the scrubber and the primary still, and thus subject it, before use, to distillation by direct steam. But this must not be carried too far, otherwise there is too great a loss

of lighter fractions, and a decrease in naphthalene solubility. In any case there is a tendency for the wash oil gradually to become more saturated with naphthalene, so that as much as possible must be eliminated constantly by the primary still.

The wash oil, by constantly passing through the primary still, will gradually lose more and more of the light-oil fractions, will thicken, and become less efficient as a naphthalene solvent. But these light oils are recovered in the residue from the final benzole distillation, and should be returned to the scrubbing process. At the same time such heavy hydrocarbons as phenol and pyridine should be returned, so that the wash oil is as far as possible saturated with them, and the gas retains a fair proportion for the protection of mains and services against corrosion. The greatest care must, of course, be exercised to eliminate the naphthalene from the residue before the latter is returned to the washing process. It should be treated during the benzole distillation with indirect steam up to 150° C., and then cooled at any rate to below the scrubber working temperature. If this is not done, solid naphthalene may crystallize-out there, with the immediate result of a high naphthalene vapour pressure.

For naphthalene determinations the author recommends the use of the Glaser-Mezger method ("Das Gas- und Wasserfach," 1921, p. 413). The cooling method gives results far too low, which may easily lead to trouble in regulating the benzole plant.

A POPULAR PUBLICATION.

The thirty-sixth edition of the "Practical Engineer Mechanical Pocket Book and Diary" was published on Jan. 7; and in it many of the notes have been entirely re-written, while new matter introduced has had the effect of increasing the number of editorial pages to 596. Of the improvements effected, those under the following headings are a few which call for particular mention: Design and Construction of Boilers, Standardization of Chain Gearing, Improved Wire Ropes for Power Transmission, Venturi Water Meters, CO_2 Recorders, Boiler Mountings, Steam and Feed Pipes, Tube Cleaners, and Rope Gearing. Special care has been bestowed upon the revision of the index—an important part of a book such as this, which covers so wide a range—to ensure that the information relating to any subject shall be readily accessible. On glancing through this edition it is apparent that the popularity which it enjoys in no way influences adversely the desire to improve the work in each succeeding year, so that it may in all respects be thoroughly reliable to practical engineers.

An interesting section deals with the use of gas-works coke and breeze as fuel for steam-raising. Some system of impelled draught is usually necessary, it is stated, except in cases where the natural chimney draught available is sufficient. The system of forced draught employed may be a form of steam-jet blower (such as is supplied by the London Coke Committee) which is readily applied to the enclosed ashpit of Lancashire or water-tube boilers. At normal loads these blowers will consume about 3 p ct. of the total steam generated; but this limited supply of steam to the furnaces has a beneficial effect on the combustion of the coke, and by its cooling effect on the firebars their useful life is considerably lengthened. In hand-fired furnaces fitted with suitable steam jet blowers, rates of combustion exceeding 25 lbs. per sq. ft. of grate area per hour are maintained. In power station and other large steam plants, the Underfeed Stoker Company's travelling grate mechanical stoker is largely used with coke. Normal average rates of 37 lbs. of breeze per sq. ft. of grate area per hour are maintained. The "Sandwich" system of burning coke with coal in superposed layers is also mentioned. Under ordinary conditions of natural draught, rates of combustion exceeding 30 lbs. are obtained; and actual working results with a 50 p.ct. mixture of bituminous slack and coke breeze give practically smokeless combustion, and show an average evaporation of 7·8 lbs. per lb. of composite fuel.

Altogether it is a satisfactory little volume, as also is its price, which in cloth is 2s. 6d. net, and in pluviusine 3s. net. It is obtainable from the Oxford University Press, No. 1, Bedford Street, W.C.2.

Cork Floor Tiles Baked by Gas.

It is stated by the "American Gas Journal" that a gas-fired oven 120 ft. long, through which heavy iron moulds containing ground cork travel at the rate of 45 minutes for the trip, is a recent industrial application of gas. These cork tiles, which are utilized as a floor covering in banks and office buildings, are made by grinding the cork and moulding it under a pressure of 5000 lbs. per sq. in. After the material has been pressed into the mould, it has to be baked at a temperature that will cause the natural resin to flow and to act as a binder. An even temperature of 600° must be maintained throughout the length of the oven, because any variation in the heat produces a change in the colour of the finished product. Ten pyrometers, set along the side of the oven, indicate the temperature of the different parts, and by this means the gas-burners can be properly regulated for each 10 ft. of length. In addition to the tiles in process of baking, some 7 tons of iron (the weight of the pressure moulds) pass through the oven in an hour, and this metal must be heated to, and maintained at, 600° throughout. Cork tiles of three shades are manufactured in this manner, the colour changes resulting, as already remarked, from temperature variations.

THE USE OF PNEUMATIC TOOLS FOR RE-MAKING LEAD JOINTS.

By H. J. ESCREET, B.Sc., Assistant Distributing Engineer to the Gas Light and Coke Company.

[A Paper read before the London and Southern District Junior Gas Association, on Friday, Jan. 25.]

A large proportion of the gas distributed by the Gas Light and Coke Company is made at the Beckton Works, and is pumped to the city through two 48-in. mains. These mains were laid in 1867 to 1870, the route followed being Beckton Road, East India Dock Road, and Commercial Road; and at that date these roads all had macadam surfaces. The paving now consists of granite setts or wood blocks laid on from 12 in. to 18 in. of concrete. This change in the character of the surface, together with alterations in the road level in many places, has greatly reduced the elastic cover over the mains—in fact, the concrete partly surrounds the sockets in many places. These circumstances, combined with the extremely heavy traffic on the roads during recent years, have led to a great number of leaky joints; and for the last ten years we have seldom had less than two gangs working in the Commercial and East India Dock Roads.

The average cost of opening on a joint is £25. It is therefore obviously unsatisfactory merely to set-up the face of the joint, a cure which often lasts only for a year or two. In 1916 it was decided that a more lasting repair would be effected by cutting-out an inch of lead from the front of the joint, setting-back the remaining ring of lead, and then running a second joint in front of the original one. Apart from the extra efficiency of the double joint, this method cleans out any tar or liquor that may have formed a film between the lead and the iron of the socket, and enables intimate contact to be obtained between the new lead and the iron. This film of tar or liquor cannot be cleaned out in the ordinary method of setting-up, and prevents a really tight joint being made.

THE TOOLS AND APPARATUS EMPLOYED.

It is not practical to cross-cut out a strip of lead from a joint by hand, and experiments were therefore made with pneumatic chipping hammers; the chisel "bit" being replaced by a "cross cut," and the same hammers with other "bits" were used for setting-up. These experiments proved that the pneumatic tools were well suited to the purpose; and after a thorough trial with a small plant during the remainder of the war period, it was decided in 1920 to purchase three portable air compressors, and to use this method as far as possible on all the 48-in. main escapes.

The portable compressor sets consist of a Reavell S.5.E. "Quadruplex" compressor, belt-driven from a 14-H.P. Parsons petrol engine; the two machines being mounted on a truck, together with an air receiver. The output is 78 c.ft. of free air per minute, at 80 lbs. per sq. in. Benzole is employed for fuel, and the consumption is 0·8 gallon per hour.

In addition to using pneumatic tools for the work on the joint, a rock drill is employed to facilitate the removal of the concrete road foundation. In moderately hard concrete, it is possible to use the rock drill at the same time as the two hammers; but as this involves running the compressor "all out," we do not use the three tools at once except for short periods.

DETAIL OF THE WORK ON THE JOINT.

The pneumatic hammers used are the "B.K." type manufactured by the Consolidated Pneumatic Tool Company, Ltd. The bits for cutting-out the old joint are a modification of the ordinary "cross-cut." Right and left hand points are required, and the set of tools consists of nine pairs of thicknesses from ⅛ in. to ⅜ in. Two joint makers work together, one on each side of the main, and commence by working towards the centre of the top portion of the joint. After a start has been made by cutting-out about 2 ft. to the required depth, the jointers work outwards and downwards round the joint, cutting-out a continuous strip of ¼ in. to ½ in. thickness. Several such strips are cut-out, until the lead has been removed to a depth of about 1 in. The remaining lead is then driven back into the joint until 1½ in. to 2 in. space is left in front of the joint. Ordinary setts, adapted for use in the "B.K." hammers, are employed for this purpose. The joint is re-run with lead, just as in making a new joint, and set-up with the same tools as are used for setting-back; the "lip" being cut off with a chisel bit in the hammer. About ½ cwt. of new lead is required for each joint re-run. The time taken per joint is about 3½ hours, of which 1¼ hours are taken in cutting-out, 20 minutes for setting-back, ½ hour for re-running, and 1¼ hours for setting-up, two jointers being employed.

The cost of the compressor, including fuel, attendance, depreciation, and maintenance, is approximately 7s. 3d. per hour; and with labour at 1s. 8d. per hour, and lead at £26 per ton, the cost per joint is 45s. The old method of setting-up by hand took about 3 hours per joint, costing 10s. The total cost of the work per joint, including excavation and reinstatement, is in either case £25; so that the percentage of the total cost spent on repairing the joint is 9 p.ct. and 2 p.ct. respectively by the two methods. When using pneumatic tools for the work, we save money in getting out the concrete, and this compensates for the extra cost of the actual joint repair; hence the total cost of the work is roughly the same in each case.

The cost of the work done on the joint itself may be taken as a rough criterion of the efficiency of the repair.

DRILLING CONCRETE.

Our practice for this work, in which a series of openings about 7 ft. by 5 ft. have to be made, is to drill 1¼-in. holes through the concrete, 9 in. apart, all over the surface; a small area near the centre of the opening is then drilled with holes very close together. The concrete is broken-out with hammer and wedge. The closely-drilled portion is attacked first; and this having been broken-up, we work from the face so formed. The drilling enables the wedge to get a good grip, and the concrete is burst out in large pieces. The "Jackhamer" rock drill (Ingersoll Rand Company, Ltd.) is used for this work.

Where the surface paving consists of granite setts with close cement joints, one or two rows of setts are closely drilled, and then broken-up. The remainder can then be removed with hammer and wedge. For poor concrete a small pneumatic pick is used, and this is also handy for removing the granite setts, if the joints are wide and not too strong.

As regards cost, 2½ hours' drilling will enable four men with hammers and wedge to make an opening in 3 hours, which would take two or more days using hammer and wedge only; the relative cost being £2 10s. by the former method, against £5 by the latter. The cost of drilling 15-in. concrete is about 10s. per square yard; the time taken per yard being just under one hour. In addition to the compressor charges, there is the cost of sharpening drills. One drill will last for 1·2 square yards—say, 20 holes—and the cost of re-sharpening is 3s.

AN ALTERNATIVE METHOD.

An alternative method of removing concrete is the use of heavy pneumatic picks or road-breakers. In experimenting with these tools, we have found that much time is taken in making the first opening, when the concrete is thick. Once a face is obtained, the concrete may be broken-out rapidly, if several picks are used fairly close together at about 6 in. back from the face. We have not used these tools on our joint repair work, because the air capacity of the compressor sets is only sufficient to work one of them, and the time taken would be too great for any saving to be effected.

My Company have recently purchased a set consisting of a Q 6½ by 4½ "Quadruplex" compressor driven through a clutch and reducing gear by a 28-H.P. Parsons engine. The set is mounted on a truck fitted with springs and rubber-tyred wheels, so that it may easily be towed by a lorry. The capacity is 150 c.ft. of free air per minute, which is sufficient to work four heavy picks. This set is to be used for breaking the concrete for main-laying or for emergency escape work.

FURTHER FIGURES OF COST.

I have mentioned £25 as the total cost per joint; it may be of interest if I give more details as to the making-up of this amount:

	£	s.	d.
Removing setts	2	0	0
,, concrete	2	10	0
Excavating round joint	2	6	0
Work on joint	2	5	0
Filling-in on joint	2	19	0
Other charges	4	0	0
Paving	9	0	0
	£25	0	0

The cost, of course, varies with the depth and position of the main. Some portions of the 48-in. main are under the tram tracks, and in these cases an opening has to be made at the side of the track and a heading driven to the joint. The labour charges are obviously increased, though a saving is made on reinstatement of paving; an opening of about 4 ft. by 4 ft. being sufficient. The cost given above is an average figure for the work when the main is at a depth of 3 ft. on top.

We have found that a gang of fourteen men is the most suitable, with four openings worked on at a time—one being filled in, one joint being repaired, one hole excavated, and the fourth having the paving and concrete removed. With this method of working, the compressor is in use for 20 hours per week, and four to five joints are re-made weekly. The compressor attendant does excavating when the machine is not running, so that the charge for attendance is fixed; but depreciation and upkeep charges per hour are dependent upon the hours running, and are necessarily somewhat high when the plant is only in use for 20 hours per week. We employ a mechanic to carry out minor repairs, and 25 p.ct. of his time is charged against each compressor.

As to the success of this method of re-making joints, I can only say that the first joints re-made in 1917 have given us no trouble since. There has not yet been sufficient time to obtain definite information in this matter, but it is probable that the re-made joint is better than the original, and will last many years.

The only trouble experienced has been with somewhat weak sockets, which are overstressed by the double setting-up. In several cases splits have developed, and we now leave the joints uncovered for 24 hours after re-making, so that any defect may be noticed. If a socket is obviously weak, we put a band on it before re-making the joint.

I wish to thank the Company for giving me permission to read this paper.

The reading of the paper was accompanied by a series of lantern slides, which showed the apparatus used, &c.

Discussion.

The PRESIDENT (Mr. Walter Grogono, of the Gas Light and Coke Company) remarked that the paper to which they had just listened was of very great interest to them, particularly at the present moment. One of the problems with which the gas industry was faced just now was how best to deal with the mains in roads of a special nature, while, on the other hand, the problem by which the road-making people were confronted was that of constructing a road which would successfully resist the heavy lorries now in use. The author had mentioned the breaking-out of concrete by the "Jackhamer" Ingersoll-Rand rock drill. He presumed that this was a compressed air tool, and not a water-wave hammer.

Mr. ESCREET: That is so.

The PRESIDENT inquired whether Mr. Escreet had had any experience with the water-wave hammer for cutting-out concrete. Going back to the opening lines of the paper, it was stated that the two 48-in. mains from Beckton were laid in 1867 to 1870. Could the author tell them how much gas made at Beckton was passing through these mains at that time? It was an interesting fact that the two mains which carried the gas in 1870 were still doing so, in spite of the great increase which had taken place in the output in the meantime. Did he know what this increase actually amounted to, and what addition had had to be made to the pressure in order to cope with it? Later in the paper occurred the statement: "As regards cost, 2½ hours' drilling will enable four men with hammers and wedge to make an opening in three hours." He (the President) was not quite clear as to the precise meaning of this.

Mr. ESCREET: 2½ hours spent on drilling will make it possible for four men to cut the concrete out in 3 hours with hammer and wedge. There is only one man during the first 2½ hours for drilling.

The PRESIDENT remarked that they were fortunate enough to have with them Mr. Parkinson. Perhaps he would be so kind as to open the discussion.

Mr. B. R. PARKINSON said he regarded it as a privilege to be allowed to open the discussion on a paper which was of great interest to him personally. It might be worth while pointing out what perhaps most people already knew, that the ordinary lead joint, as it used to be run, was possibly about 3½ in. from back to front. Caulking at the very best only influenced it for about ⅝ in.—probably the ordinary caulking, that used to go on in the past, not nearly so much as that. The remainder of the lead had been entirely worthless so far as its jointing value was concerned, particularly because it shrank on cooling. Caulking could only be carried out so as to influence the whole of the lead in the joint, if the lead were run in two or three rings, each caulked separately. One could get a well caulked yarn joint to stand 15 lbs. pressure. A great advantage that lead wool had conferred on the industry had been the emphasis laid on caulking; the whole virtue of lead wool was in the caulking. For very large joints lead wool was perhaps not so convenient as with smaller mains. The plan which the author had described for existing mains, of cutting-out the front part of a joint, and caulking it, and then running the joint again and giving it a second caulking, was an ideal method. He desired specially to thank Mr. Escreet for his paper.

Mr. F. A. FROST (South Metropolitan Gas Company) agreed that the paper was of supreme importance to distributing engineers at the present time. One had only to listen to what the author had to say to realize the difference in the work of repairing joints now from what it was when roads were chiefly made with a macadam surface. At the outset, it was just as well to remember that these 48-in. mains had been laid fifty years. Personally he would rather prefer to call the work something in the nature of a complete overhaul. From what one knew of mainlaying half-a-century ago, it was more than probable that the work at that time was not done quite so well as would have been the case to-day. There was mention in the paper of the presence of tar and liquor; but it seemed to him that there should not be the slightest vestige of tar in a main used wholly for the conveyance of clean finished gas to the district. Some years ago the South Metropolitan Company found—he was speaking now of works practice only—that in the case of pipe lines for the conveyance of tar, or liquor contaminated with tar, the tar had a disintegrating effect on the lead, and after very careful investigation the conclusion was arrived at that lead was not the material to use in making pipe joints where there was likelihood of any tar being present. It was therefore discarded, and quite a considerable amount of money had been spent in changing over to turned and bored joints, which had never given any trouble. Perhaps the author would tell them something about this film of tar, as it was certainly a very interesting point. The South Metropolitan Gas Company, in their 48-in. mains, had never found any trace of tar. In discussing the possibilities of lead wool for making joints, it must be borne in mind that, with the ordinary method, a good deal of time must be taken up in heating the lead and running it, and the running of a joint that was going to prove efficient was not quite so simple a problem as might at first sight appear. Another point was in connection with the stresses which might be set up in the sockets themselves. Where the socket was split, as must occur from time to time, he would like to know whether the author experienced any difficulty in dealing with the trouble. One thing which appeared to him (the speaker) to be of real importance in joint making was the selection of a suitable lead. It was necessary to be exceedingly careful as to the source from which the lead was obtained. He always saw to it that only the softest possible fresh wrought lead was employed, and also that it did not contain any other metal.

Mr. W. L. WESTBROOK (North Middlesex Gas Company) said mention was made of these mains running under a tramway track. In that case, had the author had any trouble at all from electrolysis and fusion? It seemed that this would be a very grave matter with so large a main, and he would like to know whether any precaution was taken to prevent it.

Mr. LEONARD LACEY (Gas Light and Coke Company) inquired whether the re-making of the joint was confined to cases in which leakage was known to be taking place, or whether there was a routine

plan followed of taking a certain length of trunk main and dealing with it straight along a road, where it was known that the main had not been attended to for a long time, just for the purpose of setting-up the joints.

Mr. W. T. KENSHOLE (Lea Bridge District Gas Company) thought it would be interesting to know the length of the main referred to, which was doubtless considerable. He believed that in some of the provincial towns now it was becoming the practice to use a heavier section of cast-iron pipe—that was, the water section. If he remembered correctly, for a 12-in. main, the ordinary thickness was something over 0·5 in., while the water section was about 0·88 in. This was a pretty considerable difference, and would make the main very much stronger. He recalled a paper read a good many years ago—possibly about 1910—in America, on the subject of pneumatic tools for setting-up joints, and it was stated there that the quantity of extra lead which could be got into a joint amounted to somewhere between 10 to 15 p.ct., and, of course, the joint would be so much more solid. Was it the practice of the Gas Light and Coke Company to use the heavier section pipe?

The PRESIDENT: Could the author give us some more information about cutting-up roads? Has he yet had to deal with any roads reinforced with steel?

Mr. ESCREET, replying to the points that had been raised, said his Company had not made use of water-wave drilling by the Dorman Long process; but he imagined that it could be employed in a very similar way to the pneumatic tools. He had not very much information as to the conditions existing when the 48-in. main was first laid, but he believed in the early days a plant was put in for 20 in. pressure at Beckton. The quantity of gas would probably be about one-sixth of the present pumping capacity. The pressure now was anything up to 52 in. They had not used pneumatic tools on re-inforced concrete roads, but where they had had roads of this character to deal with no great difficulty was experienced, provided suitable tools were used to cut away the re-inforcement. Tests were carried out some years ago to ascertain whether it was worth while opposing the making of these roads. Samples of concrete were put down with and without re-inforcement, and afterwards the re-inforced concrete came out more easily than the other. He thanked Mr. Parkinson for his remarks on the double caulking process. Of course, caulking did go back only for a short distance in the lead, so if one could caulk twice a better joint resulted. Personally, he was not particularly keen on lead wool. It had been suggested that possibly the mains referred to in the paper had not been too well laid in the first instance, but he thought the quality of the jointing and pipe work was good. As to the presence of tar, this might be a relic of the old days. Gas might have left Beckton a little unclean fifty years back. At any rate, there was a certain amount present, and when the lead was cut out a black layer was found round it. He had heard of other companies having syphons blocked up with tar, &c. In setting-back the lead into the socket, especially if the socket was not quite parallel, it might be strained; but they did not find any difficulty in dealing with splits, which mostly went only a few inches to the back of the socket. They usually drilled a hole to prevent the crack spreading, and applied a patch, adding strengthening bands round the socket if necessary. Most of the London County Council tramway routes were on the conduit system, and no trouble with electrolysis arose. There was in their district a short length of overhead wires, but so far as he knew no instance of electrolysis had occurred. As to whether the work described was a matter of routine or merely for stopping leaks, up to the present they had in all cases been tackling leaks. When an escape was reported, they got to work, and went on with it until they found several joints which did not show any signs of leakage, and then they gave it up. When they got further on with the work, they hoped to deal with the matter systematically, for they wanted as soon as possible to get the whole of the 48-in. joints treated in this way. Of course, it would be a very long process. They were doing perhaps 400 or 500 joints a year now, and had been at the work for three years. It would take a good many years yet before they reached the end of the job. The distance from Beckton to Aldgate was 7 or 8 miles, but the total length of main was 29 miles. As to the statement of American experience that with pneumatic tools the extra lead which could be got into a joint amounted to 10 to 15 p.ct., it was rather difficult to understand where this came in, unless the lead had been badly run in in the first place, and hollows were thus being filled up. The 48-in. mains were, of course, laid a long time back, but nowadays all the Company's pipes were British Standard, Class A.

The PRESIDENT remarked that they were all very much indebted to Mr. Escreet for his paper, the lantern slides, and the additional information which he had given them afterwards. It did not fall to every one's lot to have the chance of looking after long lengths of 48-in. mains—especially mains laid as far back as 1870. In the very old gas books frequent reference was made to these particular mains.

Mr. WESTBROOK proposed a hearty vote of thanks to the author for his paper, and to the Gas Light and Coke Company for permitting the Association to have the advantage of the information which it contained.

Mr. W. R. MOGER (Tottenham) seconded the vote, and asked whether the Company had used lead wool for mains of less than 48 in., and if so how it compared in the matter of cost with the ordinary joint. In cutting-out the joints, did the author find that yarn had originally been used in any form for caulking, before the lead was placed in?

Mr. ESCREET replied that he looked upon it as a privilege to submit a paper to the Association. They had used lead wool on small steel mains for high-pressure work, but he had not with him any figures of cost. At the time the Beckton main was laid, yarn was used at the back of the joint.

Institution of Welding Engineers.—An ordinary meeting of the Institution will be held in the Lecture Hall of the Institute of Marine Engineers, Tower Hill, on Tuesday, Feb. 12, when a paper entitled "Some Chemical Aspects of Welding" will be read by Mr. J. R. Booer, B.Sc., F.C.S. The meeting will commence at 7 o'clock.

NAPHTHALENE.

By H. P. LUPTON, B.Sc., A.I.C., of Liverpool.

[A Paper to be read before the Manchester and District Junior Gas Association, on Feb. 6.]

Troubles from naphthalene stoppages are not yet at an end; and therefore it is hoped that some of the rather disjointed items which are set forth in this paper may be of service.

It is generally recognized that in present-day systems of carbonization, some naphthalene must be produced. Any of the hydrocarbons of coal gas or of carburetted water gas are convertible into naphthalene; the amount of this action depending upon the temperature to which the primary products are subjected and upon the time over which this temperature exerts its influence. Hence, in selecting a system of carbonization, it is wise to choose one in which the coal is heated in a way that will expose the gas generated to as little secondary heating as possible. In vertical retorts, the naphthalene content of the gas is low. This seems to be due to the fact that at no one time is a large mass of coal undergoing carbonization, and that the gas produced passes rapidly from the retort, with a minimum amount of exposure to either radiant heat from the sides of the retort or to the heat from a body of incandescent coke.

Now that the old illuminating standards have been done away with, there is no longer any necessity—if such ever existed—for keeping naphthalene in the gas. As ten grains of solid naphthalene will block up a half-inch pipe for a length of about one foot, it would seem a wise policy to prevent, if possible, any naphthalene from going into the district, where small-diameter services abound. To do this, it has been suggested that the gas should be cooled to a degree as low as, or lower than, the temperature met with outside. This might be accomplished by the use of two sets of condensers—one set occupying the usual position on the crude gas stream, and the other occupying a position directly before the inlet to the district governors. In each set the condensers should be of the best type and of ample capacity. The second set would be the low-temperature machine, and might be kept cool by being fed with water taken from the bottom of the gasholder tank. It is well known that a dry gas will not deposit naphthalene as readily as will a wet gas. The condensation of moisture may give the necessary shock for the formation of naphthalene crystals, or the decrease in volume of the gas due to this loss of moisture may decrease the carrying power of the gas. Be that as it may, where deposition of naphthalene has taken place, it is frequently found that the section of main preceding the deposit is especially wet. If this final condenser cooled the gas sufficiently low to meet the seasonal low temperatures of the distribution system, the water absorbed by the gas during its passage through the purifiers, meter, and holder would be removed, and the gas would only carry that amount of moisture necessary to saturate it at the low temperature to which it has been cooled. In this way, condensation on the district would be done away with, or almost so, and the likelihood of naphthalene deposition would be greatly reduced. This system, however, would still leave some naphthalene in the gas; and for complete elimination some type of overflow washer should be installed.

CAUSES OF NAPHTHALENE DEPOSITION.

When the gas leaves the works, it may or may not be saturated with naphthalene vapour. If the gas could be kept at an even temperature all the year through, and throughout its travels to the consumer's burner, all would be well; but some time during the year the gas will be subjected to a lower temperature than that at which it leaves the works. As the temperature falls, the amount of naphthalene which the gas is capable of carrying becomes less and less, and so, sooner or later, according to the amount of naphthalene originally present, a temperature is reached when the gas must throw out some of it. When this takes place, the vapour changes into a white crystalline solid; and this is the possible foundation of a future stoppage.

The source of all the trouble is, then, temperature change, and the fact that naphthalene changes from a state of vapour directly into a solid. In the spring and early summer, the temperature of the large distributing mains lags well behind the mean of the fluctuating surface temperatures. A gas saturated with naphthalene at the surface temperature will be unable to carry all its naphthalene when it comes in contact with the colder mains, and will therefore deposit crystals. These mains being of large diameter, very little or no trouble will be experienced from the deposits. In autumn and early winter there is again a lag in temperature, but this time the temperature of the mains is higher than the mean surface temperature. A gas saturated at this surface temperature no longer tends to deposit naphthalene in the large mains, but rather would cause some of the old deposits to re-volatilize. The gas thus loaded with naphthalene passes on and reaches the smaller mains and service pipes. These, being shallower, are colder than the larger mains, and hence the gas deposits some of its naphthalene there; and it is not long before naphthalene troubles commence.

To show how closely naphthalene complaints follow this rise and fall of temperature, the following chart has been prepared. It will be seen that when the mean surface temperature is lower than the mean temperature of the buried mains, trouble from naphthalene immediately appears.

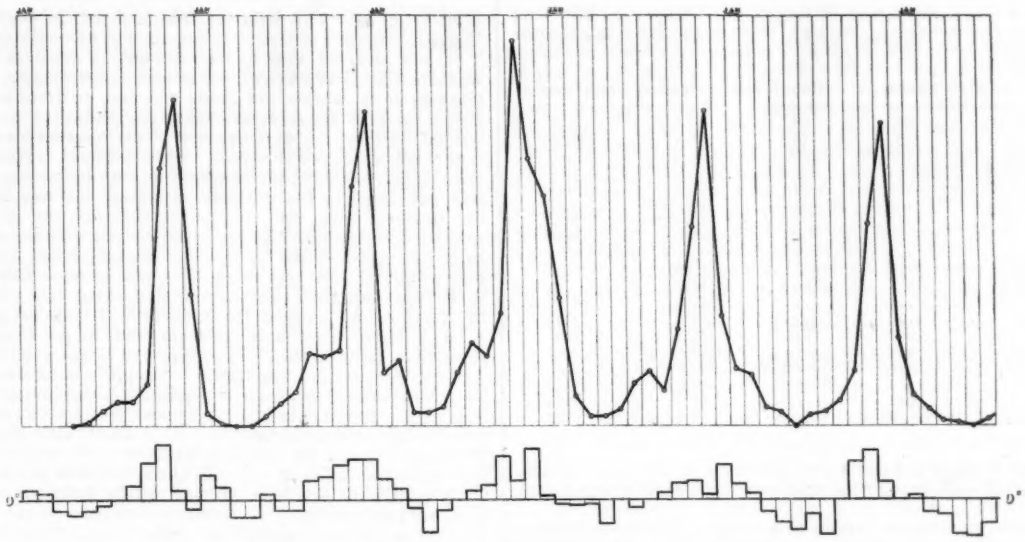


Chart Showing Relation between Number of Naphthalene Stoppages and Temperature Changes.

Main 3 ft. below surface. Surface temp. = zero line.

In a great number of works some method is adopted which has for its object the lowering of the naphthalene content of the gas. Among others, the following methods may be mentioned:

(1) Sudden condensation, or "shock cooling," of the crude gas.
(2) Washing the gas by means of an oil free from naphthalene.
(3) Volatilization into the gas of an oil which has a strong affinity for naphthalene.
(4) Spraying into the distribution system an oil which has similar properties to those mentioned in (3).

The sudden condensation method has found many advocates, but it would seem that the volatile hydrocarbons, chiefly benzole and its homologues, which are condensed out and flow away with the tar, would be of greater service in the gas; for not only do these hydrocarbons raise its calorific value—though this effect is very slight—but they act as naphthalene solvents.

The systems of volatilization and spraying have also many advocates. The peculiarly elusive nature of naphthalene is well illustrated here, for, by the use of these methods, some engineers have obtained complete freedom from naphthalene trouble, while others have experienced no relief. The oil used is generally a petroleum with a vapour pressure sufficiently high to ensure that a drop of temperature in the mains will cause enough oil to be thrown down to dissolve any naphthalene which may be deposited through this same fall in temperature.

In 1920, two incidents occurred which caused an inquiry to be made into the nature of the vaporizing oil which was being used at one of the Company's stations. In the first place, a considerable layer of oil formed on the surface of one of the gasholder tanks; in the second, the offices at the station had reason to switch over from their normal supply of gas, which came from another station, to their own make. Shortly after the change, oil made its appearance at the burner heads. A sample of oil was therefore distilled; and it was found that only 19 p.ct. came over below 200° C. A further sample was raised to a temperature corresponding with a steam pressure of 40 lbs. per sq. in., and a stream of gas was blown through it. At the end of 7 hours, only 0·5 p.ct. of the oil had gone forward with the gas; 9·5 p.ct. having collected just outside the bubbler, and 90 p.ct. remained in the bubbler. From the above figures, it was evident that only a very small percentage of the oil would be carried forward as a true vapour by the gas. The remainder—for very little residue was collected from the vaporizer—must be merely in mechanical suspension.

This led to a further inquiry into the vapour pressures and boiling-points of a number of vaporizing oils. For the former, two sets of apparatus were used—viz., one similar to that employed by Rhead, and described in the "GAS JOURNAL" for Jan. 30, 1917, p. 207, and the other similar to that used by Thomas and described in the Journal of the Society of Chemical Industry for 1916, p. 507.

RESULTS OF THE INQUIRY.

As a result of this inquiry, the following conclusions were drawn. For the effective prevention of the deposition of solid naphthalene, it is essential that the gas should be saturated, or as nearly saturated as possible, with vapours which, when condensed, are good solvents of naphthalene. Such being the case, it follows that the higher the boiling point of the oil, the more effective will the vapour be, provided, of course, that sufficient vapour can be carried by the gas. In the majority of oils tested, the boiling point is so high that the amount of oil which can be taken up as true vapour is too low to prevent naphthalene deposition. To secure the required amount of the solvent at present in use, it would be necessary to introduce it into the gas in the form of a mist or spray. One oil, however, differs greatly from the rest, and its use would seem contrary to the principles just stated. Its boiling-point is low, and its vapour pressure high, so that, whereas 2·65 p.ct. by volume of the vapour of the oil at present in use would saturate gas at 15° C., it would require 17·4 p.ct. of this oil. Owing to the low boiling-point, the amount of oil which can be taken up as a true vapour will be large. Further, solid naphthalene seems to have a powerful affinity for the vapour, absorbing the latter and dissolving in it, in the same manner as calcium chloride absorbs water and then dissolves.

As a result of this inquiry, this latter oil was tried; and during the ensuing year naphthalene complaints were almost a thing unknown. But a year later complaints began again, and it was found that the cure for naphthalene had not yet been discovered.

Of course, the system of vaporizing does not depend for its effectiveness only on the successful saturation of the gas with oil vapours. It also depends on the successful formation of a vapour mist. The gas passing through the vaporizer is saturated at a relatively high temperature. This enriched gas is then added to the main stream; and if the cooling due to this addition be sufficiently rapid, the excess of oil remains in suspension as a fine mist which may be carried for miles. Should the cooling not be sufficiently sudden, then the excess of oil will tend to come down almost immediately after the point of admixture, and will be found in the syphons adjacent to the works.

While the above inquiry was in progress, the Company decided to recommence the extraction of benzole, and to use for this purpose a small plant at Athol Street. In the selection of an extracting oil, particular attention had to be paid to the influence likely to be exerted by the oil on the naphthalene content of the gas. In addition, therefore, to the usual distillation, specific gravity, viscosity, and cooling tests, the oils examined were subjected to the following test:

> 200 c.c. of oil were put into a flask, and gas, passed previously through picric acid, was slowly bubbled through. The gas was then led into picric acid solution. In many cases 8 or more grains of naphthalene were picked up from the oil by 100 c.ft. of gas.

Looking round for an oil which would satisfy all requirements, it was found that gas oil seemed to be the most suitable. This oil was therefore adopted, and gave every satisfaction. When benzole extraction ceased, it was decided to continue the use of the oil for naphthalene extraction, especially since the spent oil could be returned to Garston for use in the carburetted water-gas plant. For a time, the washer, which was a Livesey, worked extremely well, but then its efficiency began to fall-off. Investigation showed that the water content of the oil had become considerable. As the washer had originally been fitted for the use of an oil heavier than water, whereas now an oil of specific gravity of only about 0·85 was being used, it was apparent that any water which condensed out in the washer (and the latter was in an exposed place and immediately after the purifiers) would stay in the washer, and displace gas oil. The position of the water take-off was therefore altered. Further, to avoid deposition of water in the washer, a closed steam coil, fed by exhaust steam, was inserted. The flow of steam was so regulated that the temperature of the oil was kept three or four degrees above that of the incoming gas. These alterations proved entirely successful, as the following [overleaf] figures show.

On Aug. 20, 670 gallons of new oil had been put into the washer, and no further oil was added. On Sept. 10, this oil was run off, and a fresh supply filled into the washer. During this interval 17 million c.ft. of gas had been washed, so that the oil had been used at the rate of about 40 gallons per million c.ft. This method of extraction was highly successful, and so it was decided to

Date.	Temperature, ° Fahr.		Grains of $C_{10}H_8$ per 100 C.Ft.	
	Inlet Gas.	Oil.	Inlet Washer.	Outlet Washer.
Aug. 21	66	68	14·9	2·4
,, 22	64	67	19·0	Trace
,, 23	63	66	18·8	,,
,, 24	..	..	12·9	,,
,, 25	67	..	16·8	,,
,, 27	..	..	16·2	,,
,, 28	..	..	17·2	0·2
,, 29	..	..	17·0	Trace
,, 30	..	..	14·5	,,
,, 31	..	..	10·9	,,
Sept. 1	61	62	12·1	,,
,, 3	..	..	13·9	1·2
,, 4	..	..	13·4	1·6
,, 5	60	63	13·5	1·8
,, 6	62	65	14·5	2·6
,, 7	66	68	19·6	3·8
,, 8	64	65·5	16·6	3·0
,, 10	67	..	15·0	2·6
,, 11	63	64	17 4	1·0

extend the method and put it into operation at Linacre. There, too, it worked well, though the efficiency of extraction was not so high.

A question might arise here as to whether it is more advisable to withdraw the whole of the spent oil at one time and replace it by fresh oil, or to withdraw and replace it in stages. The depreciation of the wash oil is physically expressed by the greater increase in its average molecular weight; and mathematical calculations based on this change indicate that a better absorption is obtained where the wash oil is completely replaced by new oil in one operation. That it is better to work a one-chamber washer, as has been indicated above, than to have small quantities of new oil constantly entering the washer, has been fully borne out by experience at Liverpool.

A general consideration of the physical processes which take place when naphthalene is absorbed from gas by means of wash-oil, leads to the conclusion that a Livesey washer is by no means the most efficient type which could be used for the purpose. Using the minimum quantity of gas oil, a single-chamber washer will attain full equilibrium when 50 p.ct. of the naphthalene is absorbed. A higher rate of absorption can, of course, be obtained by using a quantity of oil greater than the minimum. If, now, the gas in this single chamber is passed into a second chamber, and there treated with a similar quantity of fresh gas oil, the naphthalene in the gas will be absorbed until half of it has gone into the oil. By still further increasing the number of chambers, the volumetric efficiency—that is, the proportion which the actual recovery bears to the total quantity present—may be still further increased.

From the laws which govern vapour pressure and equilibrium, there can be deduced the following formula:

$$W = \frac{p_o M_o N}{P_o} \qquad (1)$$

Where W = weight in kilogrammes of the in-going and out-going wash-oil.

p_o = vapour tension of pure naphthalene at the temperature T.

M_o = the average molecular weight of the wash-oil.

N = the number of naphthalene-free gas molecules which enter and leave the washer.

P_o = atmospheres for the uniform total pressure of the gas throughout.

From the general gas formula

$$Pv = R_oT = 0{\cdot}0821T,$$

for a volume V which contains a total of v gas molecules and where $V = Nv$, can be obtained—

$$PV = R_oNT = 0{\cdot}0821\ NT.$$

By transposing—

$$N = \frac{P_oV}{0{\cdot}0821T}.$$

If now this value for N be inserted in (1), the equation becomes

$$W = \frac{p_oM_oV}{0{\cdot}0821T.} \qquad (2)$$

The value of W thus determined—representing, as it does, the least amount of wash-oil for a scrubbing surface of infinitely large area—must, for a definite scrubbing area, be increased; but even then there is a large margin between the figure obtained and that found by actual use in the Livesey. The above considerations, coupled with the experience already gained from the Livesey, led to the belief that, with a counter-flow washer, freedom from naphthalene could be obtained. Before passing on to the experience with counterflow washers, two points might be noticed. The first is the influence of temperature on the amount of wash-oil required. From equation (2) it will be seen that the oil required is increased in proportion to the vapour pressure p_o, which is solely a function of the temperature. Hence for efficient extraction, efficient cooling of the gas before its arrival at the washer is essential. The second point to be noticed is that the molecular weight of the oil used has an apparent influence upon the amount of oil required. The presence of benzole in the wash-oil should, therefore, cause a decrease in the amount of wash-oil used.

It was decided that gas oil should be tried in two rotary washers, one at Wavertree and one at Caryl Street. These two washers both worked on crude gas, but no trouble was anticipated, the only apparent drawback being that the spent oil could not be used for the manufacture of carburetted water gas, and that much water might deposit in the washers. From the commencement, however, the efficiency of extraction was low. This was put down to the presence of water. It was thought that the brushes, being wet, no longer absorbed the oil, or at any rate not sufficiently. Hence, as the brushes rotated, they did not scrub the gas with oil, for that had already fallen back into the bulk of liquid. But this was not the real cause, which was found to be the fact that the gas oil abstracted free carbon from the tar fog, and clogged the brushes with a thick sticky mass. After a short trial, both washers had to be by-passed and thoroughly cleaned out. On resumption of work, the old washing medium, oil-gas tar, was used. This method of washing is far from satisfactory, for, while it undoubtedly does remove naphthalene from a gas rich in that substance, it cannot, except in very unusual circumstances, remove it all or nearly all. Many samples of this tar, tested by bubbling naphthalene-free gas through it, have added as much as 12 grains of naphthalene per 100 c.ft., and many on distillation have yielded middle fractions which have gone solid on cooling. Much seems to depend on the type of gas oil used in the carburetted water-gas plant. Some oils yield a tar which is very thin, has a high water content, and a low naphthalene content. If the cracking temperature for these oils be raised, then the water content becomes low, but the naphthalene figure increases. One writer on the subject states that, to obtain a tar suitable for naphthalene washing, a high gravity oil must be used. Such oils will give a tar which will contain a high proportion of heavy oil distilling between 270° and 350° C., and will be suitable for use in naphthalene washers; but they give a gas of lower quality.

To return, however, to the subject of gas-oil washing. So convincing had been the results from the Athol Street washer, that, in spite of the unfortunate experience at Wavertree and Caryl Street, it was decided to try rotary washers of the counter-flow type at Linacre and Garston. These washers were to be fixed after the purifiers. The Garston washer has been in operation for some months, and a few of the results there obtained will be given. The washer is of the brush type, with a diameter of 9 ft., is divided into eight chambers, and is capable of dealing with 2,500,000 c.ft. of gas per day. The back pressure thrown is, at present, under ½ in. of water. Gas oil is supplied from an overhead tank, and spent oil is collected in an underground one. At first, the quantity of oil supplied was at the rate of 40 gallons per million c.ft. of gas washed; but, picric acid tests on the outlet gas showing no signs of naphthalene, this quantity was gradually reduced until only 20 gallons of oil were being used. A further consideration played a part here. In benzole extraction it is found that if the wash-oil be reduced in quantity so that it becomes over-saturated, then the composition of the crude benzole changes in such a way as to decrease the benzole : toluole :: toluole : xylole ratio. In this way benzole could be retained in the gas. By reducing the quantity of oil used in the naphthalene washer, it was hoped that most of the lighter hydrocarbons would be carried forward in the gas.

During a period of one month, the average naphthalene content of the inlet gas was 8 grains per 100 c.ft., while the outlet gas seldom contained sufficient to give a test when 10 c.ft. were passed through picric acid solution. As regards naphthalene extraction, therefore, the method was entirely satisfactory. The system, however, must affect the gas, since washing with a heavy oil is one of the processes used for the extraction of benzole. Below are given for comparison the results of distillations of unused and spent oil.

Fractions. P.Ct.	Unused Oil.	Spent Oil.
10	15 to 213° C.	15 to 150° C.
20	213 ,, 221	150 ,, 189
30	221 ,, 227	189 ,, 210
40	227 ,, 234	210 ,, 226
50	234 ,, 240	226 ,, 236
60	240 ,, 248	236 ,, 246
70	248 ,, 259	246 ,, 256
80	259 ,, 271	256 ,, 269
90	271 ,, 304	269 ,, 300
Sp. gr.	0·872	0·881
Open flash point	80° C.	30° C.
Viscosity	6 24	5·43

It will be seen that the gas oil has picked up a considerable quantity of light hydrocarbons; but, in spite of this, calorific tests (over 100 have been made) showed no decrease as between the calorific value of the gas before and after washing. This result might have been expected, since, as stated above, only 20 gallons of oil are used per million, whereas in benzole extraction 5000 to 6000 gallons were required for complete extraction, and even then the calorific value was only reduced by some 8 p.ct.

Unfortunately, figures for the effect of this washing upon the number of naphthalene complaints cannot be given, since, after washing, the gas is mixed with that from other stations where this

method of naphthalene extraction has not yet been introduced. In this connection, it might be mentioned that until all the Company's stations have introduced this system, any loss of hydrocarbons is being made good by the addition of vapours from vaporizing oil.

The cost of the system is very low, since all the spent oil is used in the carburetted water-gas plant, being, for that purpose, mixed with unused oil in the proportion of about 1 to 5. The net cost is 0·03d. per 1000 c.ft. of gas—a figure which compares very favourably with that which is frequently expended in clearing mains and services.

A few words might be said on the methods of testing for naphthalene. Though naphthalene combines with picric acid to form a definite picrate, and though this picrate can be decomposed quantitatively by an alkali, yet the reliability of many results is very doubtful. In the first place, the gas which contains the naphthalene is not infrequently brought into contact with indiarubber tubing. As 2 ft. of indiarubber tubing can absorb as much as from 6 to 10 grains of naphthalene per 100 c.ft. when the gas is passing at the rate of about 1 c.ft. per hour, all possible contact of the gas with indiarubber—either tubing or stoppers—should be avoided. In the second place, naphthalene is frequently deposited in the inlet connections to the test apparatus. Long runs of service between the point of gas take-off and the test apparatus should be avoided. Thirdly, it not infrequently happens that some of the naphthalene does not combine with the picric acid, but condenses out in the free state.

As regards actual testing, many methods have been suggested, and details of these can be found in the journals. The authors of many proposals for the control of washers seem to have devoted their attention to the oil. Here are two typical examples. "The specific gravity of oil decreases as the proportion of naphthalene increases. Determine the specific gravity of new oil at 60° Fahr. Saturate the oil by passing through it gas rich in naphthalene until the escaping gas causes a precipitate in a catch-bottle of picric acid solution. Ascertain the specific gravity of the saturated oil at 60° Fahr. If now the wash-oil in actual use be tested, and its gravity approaches that just found, change the oil." This test is useless in practice, since water and hydrocarbons absorbed from the washed gas so change the specific gravity of the oil that frequently an increase is noted—not a decrease.

In the second case, it is recommended that "the naphthalene absorption figure of the fresh oil at 60° Fahr. be obtained. A sample of the used oil is then taken, and small quantities of naphthalene are added to it until it, in turn, is saturated. A comparison between the amount just added and that originally taken will give the percentage saturation of the partially-spent oil, and hence an indication as to whether the oil should be changed." Here again no account is taken of the influence of the absorbed hydrocarbons on the naphthalene absorption figure; and it has been found that a partially spent oil may absorb more naphthalene than the original oil did.

The most reliable test seems to be to have a test bottle containing a solution of picric acid on the stream of gas just as it leaves the washer, and so to regulate the flow of oil through the washer that the test solution just shows, or just fails to show, traces of naphthalene picrate when 10 c.ft. of gas are passing at the rate of 1 c.ft. an hour through the apparatus.

In conclusion, I should like to express my thanks to the Chief Engineer of the Liverpool Gas Company, for his courtesy in allowing me to place before you some of the figures contained in the paper, and to tell you of some of the experiences which have been undergone in the attempt to pave the way for a future free from naphthalene troubles.

GAS-METER EXPLOSIONS.

As a writer in the December Bulletin of the Swiss Gas Association rightly remarks, explosions in gas-meters are rare occurrences. It is, therefore, the more remarkable that he has three cases to report which happened within a short period in the districts of three different companies. The first occurred in a part supplied at pressure, without local storage, from a works 10 miles away; the mains being 60 mm. (2·34 in.) and 80 mm. (3·12 in.). The trouble was that, about midday, the gas consumption increased to such a degree that the available pressure at the works was not sufficient to keep some of the farthest burners alight. These went out, air was drawn into the pipes, and explosions, with serious material damage, occurred in two meters on successive evenings. This was remedied a few days later by the installation of greater boosting capacity at the works.

The second case related had its origin in the old enemy naphthalene, which had been giving trouble in the district, and had been located at a certain point. The street main of 60 mm. (2·34 in.) was bored, and about three pints of suitable solution injected. With the idea of better directing this to the source of the trouble, the not very experienced operator proceeded to pump into the small pipe, under pressure, what amounted to between 3 and 4 c.ft. of air. Nearby was a 100 mm. branch supplying a group of dwellings some 500 yards away. Burners crackled at first, and would not light, but subsequently explosions took place in six meters, again with much material damage.

In the third instance a family in a tenement house in the neighbourhood of a large factory gave up an attempt to cook owing to crackling and lighting-back of burners. Trying again later, all the meters in the house exploded. The gas company took samples of the gas remaining in the services of all affected houses, which on analysis showed carbon dioxide and heavy hydrocarbons 7·4 p.ct.; oxygen 33·4 p.ct.; hydrogen and methane 49 p.ct.; and nitrogen 10·2 p.ct.! Further investigation disclosed a welding plant for coal gas and oxygen at the factory, coupled up, without the gas company's knowledge, with their supply service, and no hydraulic safety valve. To make matters worse, faulty burner connections rendered easier the back-flow of oxygen into the mains. These being small, a comparatively small quantity of oxygen had sufficed to set up an explosive mixture.

The author rightly remarks that the moral of such accidents is the proper training and instruction, especially in details, of personnel.

RECUPERATIVE GAS-FURNACE EFFICIENCY.

That gas is the ultimate fuel for industry is the firm conviction of Mr. Henry O. Loebell, Vice-President and General Manager of the Combustion Utilities Corporation. He advanced cogent reasons for this belief in an address to the Rhode Island Chapter of the American Society for Steel Treating, at Providence. To-day, he said, in practically all fields of metallurgy, apparatus is available which represents great improvement in furnace design, and which is more desirable from an economic standpoint than either coal or oil fired furnaces, and in many cases the electric furnace. In this connection, he made special reference to one adaptation which, he remarked, is going a long way in improving furnace efficiency and economy, and which he thinks is so important that it is only a question of time before every furnace will be so equipped. This is the principle of recuperation—the method of utilizing the waste heat in the flue gases to pre-heat the air, and often the gas, used in the heating operation. One has only to bear in mind, he said, the fact that the average furnace working at 2000° Fahr. allows more than half the heat to pass up the chimney, to realize what great saving can be effected if the major portion of this waste heat is returned to the furnace to perform useful work. In a recent comparative test between an oil-fired furnace and a recuperator gas-fired furnace, the latter showed a fuel saving of 27 p.ct., and a greater production of forgings per unit time of 25 p.ct., while the number of rejected castings was only 12 p.ct. of that of the oil furnace. A recent installation at Toledo (O.) showed, as between a straight carbonizing and a recuperator carbonizing furnace, a fuel saving with the latter of 38 p.ct., and an increase of furnace production of 21 p.ct. By applying recuperation to a heating furnace operated at 2000° Fahr., a decrease in fuel consumption of 50 p.ct. was reported. Gas-fired equipment, Mr. Loebell assured his hearers, will ultimately be the solution of their heat problems, and all other appliances that they may instal will only prove of a temporary nature, and must eventually be abandoned for superior apparatus.

Flint and the Gas Undertaking.—The question of the purchase of the local gas undertaking was brought up at the Flint Town Council on Monday, the 14th inst., when Alderman Powell proposed a resolution that it was advisable to take over both the gas and water works, and that the Council appoint a committee of six to investigate and report thereon. He pointed out that the town was developing very fast, and that to cope with the demand for gas and water they must have a strong and vigorous concern that would go ahead and give them the benefits of the very latest scientific improvements. Alderman Robert Jones proposed an amendment that the Council sitting as the Finance Committee should consider the question, and this was carried.

Visit of Representatives from Copenhagen.—A party of representatives of the Municipality of Copenhagen paid a visit to the Birmingham Gas-Works on Thursday last. They are in this country studying problems in relation to gas and electricity supply. The Lord Mayor (Alderman T. O. Williams) received them at the Birmingham Council House; and after luncheon the party went over the various departments of the Birmingham gas undertaking. Accompanying them were Mr. A. W. Smith (General Manager and Secretary of the Gas Department) and Mr. John Foster (Engineer-in-Chief of the Gas Department). The visitors included Messrs. Peder Hedebol (Member of the Danish Landsting and Chairman of the Gas and Electricity Supply Committee), E. P. Wraae (Director of the Danish Provincial Gas-Works Co-operative Tar Company and of the Danish Provincial Gas-Works Coal Office), and Mr. J. F. Edelberg (Chief Engineer of the Copenhagen Gas-Works).

Electricity Breakdown in Yorkshire.—All electrically served premises of every description in Bradford were rendered void of light for an hour at tea-time one day last week, and the tramways were stopped for half-an-hour, owing to a breakdown at the Corporation electricity works, where an automatic switch, intended to turn operations instantly from a motor generator which broke down to an emergency set, misbehaved itself, and instead of enabling emergency plant to carry on it set fire to the whole switchboard, and interrupted the city electricity supply. On Monday and Tuesday last week, electrically lighted premises at Ilkley were in darkness, owing to supply failures. The trouble on Monday was a local affair, confined to certain parts of the town. The failure the next day involved the whole area supplied from the generating station at Bradford. The local Electrical Engineer then secured light by switching-on a steam generating set which the Ilkley Council have retained for such emergencies.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Institution's Education Scheme.—Examination for the Diploma in Gas Engineering and Supply.

SIR,—The correspondence I am receiving shows that there is uncertainty in the minds of many students as to the standard in ancillary subjects required of candidates for the Diploma Examinations.

The scheme very wisely, at this stage in its development, leaves these without strict definition. Hard-and-fast rules would hinder rather than help just now. The Advisory Committee have unimpaired discretion, therefore, to consider each case on its merits.

There are, however, clear indications in the scheme as to the minimum expected.

(1) Students desiring to sit for examination in the Ordinary Grade are required to have attained "a standard not inferior to that of the third year senior course of an approved technical school," or, alternatively, to "produce an Ordinary Grade National Certificate in chemistry, mechanical or constructional Engineering." (Section 2, clause 3c.)

(2) Students desiring to sit for examination in the Higher Grade are required to show "that they have received and profited by further instruction in the ancillary subjects taken for the Ordinary Certificate, or in alternative ancillary subjects approved by the Institution and the Board." (Section 2, clause 5c.)

(3) The Diploma Examination is restricted to those "who have passed the Higher Examination in both gas engineering and gas supply." (Section 3, clause 3c.)

Clearly, therefore, the standard in ancillary subjects qualifying for the Diploma Examination cannot be lower than the equivalent of the fifth year of the senior course of an approved technical school, and should be much higher.

Perhaps it may assist if I give the standards attained by one or two of the students whose applications have been accepted.

"A" has taken advanced mathematics, physics, theoretical and practical inorganic chemistry, the latter with honours.

"B" has taken the eighth year course in one of our largest technical colleges.

"C" has taken not only the senior course, but the advanced course as well, in theoretical and practical engineering mechanics, physical chemistry, and heat engines, practical gas analysis, graphic statics, and strength of materials.

Dentdale, Barton, Torquay,
Jan 26, 1924.

WALTER HOLE,
Organizing Secretary.

Japanese Earthquakes and Gasholder Safety.

SIR,—I have received some information from Japan which may possibly be of interest to you with reference to gas-works and the recent earthquakes. There are two gasholders at Yokohama, seven at Tokyo, and one at Yokosuka which have successfully withstood the shocks. I am unable to give you the builders' names, but some of these were built by English and some by German firms, and the holders appear to be intact.

At the time of their erection, there was a certain amount of opposition to their being built close to houses, on account of the supposed danger of gasholders. It is a remarkable fact that the holders have actually preserved the houses, which were sheltered by them, from the fire; and the paint on the holders was blistered without any further damage, except that the runners have slipped off the guide-rails in one or two cases. In view of the severity of the earthquakes, this is a very remarkable circumstance.

I am visiting this country in order to obtain the most recent information as to developments in the gas industry in this country; and I should be pleased if any manufacturers would send me their catalogues to this address. Should they be of interest to me, I shall get into communication with the makers. I may say that we are particularly interested in English manufacture, and have a considerable amount of English plant in Japan.

S. KUBO,
Managing Director of the Kobe Gas Company, Ltd.

Queen Anne's Mansions,
St. James' Park, London, S.W.,
Jan. 28, 1924.

National Union of Gas Industry Mechanics and Mates.

SIR,—During the war a policy was adopted by various unions of practically forcing workers into unions which never had their real interests at heart. The outcome of this was that workers in the gas industry, not having a union of their own, joined what they thought would serve their purpose best. After eight years under such conditions, no improvement has been noticed; in fact, the contrary. It was therefore decided to form an independent union; and this was registered in August, 1923, as the National Union of Gas Industry Mechanics and Mates.

This Union has been formed with the intention of bringing all employees of the gas industry to the equivalent of other workers—skilled, semi-skilled, and labourers—so that eventually a thorough understanding will be reached between master and man, and an ultimate uplifting of the gas industry in general.

T. A. TEBWORTH,
Secretary, The National Union of Gas Industry Mechanics and Mates.

46, *Camellia Street, Wandsworth Road, London, S.W., Jan.* 23, 1924.

Price Reduction at Pudsey.—The price of gas has been reduced by the Pudsey Gas Company to 8·4d. per therm, as from the 1st inst.

REGISTER OF PATENTS.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 23.]

Nos. 971 to 1592.

BROADHEAD, R. W.—"Gas condensers." No. 1124.
BUCKLEY, W. A.—"Trough coal conveyors." No. 1518.
DEMPSTER, R., AND SONS, LTD —See Broadhead, R. W. No. 1124.
DIXON, L.—"Gas-heated hotplates." No. 1263.
DUCKHAM, SIR A. M.—"Heat-treatment of materials for distilling, drying, or carbonizing them." No. 1413.
ECHBERG, A. F.—"Roadway conduits for gas mains, &c." No. 1355.
FAIRWEATHER, D. K.—"Street lamps." No. 1248.
JOHNSON, S. B.—See Fairweather, D. K. No. 1248.
M'INDOE, R. W.—"Dry gas-meters." No. 1232.
MALONE, J. F. J.—"Gas analysis apparatus." No. 1422.
MARTINEAU, F. L.—"Gas or oil water-heaters." No. 1182.
NEW STIMEX GAS STOVE COMPANY, LTD —See Dixon, L. No. 1263.
RIDER, D.—See Duckham, Sir A. M. No. 1413.
STIMSON, E. F.—See Dixon, L. No. 1263.
SWANTON, G. H.—See Echberg, A. F. No. 1355.
TAUNTON, R. P.—See M'Indoe, R. W. No. 1232.
THERMAL INDUSTRIAL AND CHEMICAL (T.I.C.) RESEARCH COMPANY, LTD —See Duckham, Sir A. M. No. 1413.
WATTS, J. S.—See Duckham, Sir A. M. No. 1413.
WILTON, L. E.—"Multi-way valves." No. 1394.

LEGAL INTELLIGENCE.

GAS REGULATION ACT PROSECUTIONS IN DERBYSHIRE.

Important prosecutions by the Derbyshire County Council under the Gas Regulation Act of 1920 came before the Eckington Magistrates last week. The Eckington and Mosbrough Gas Company and the Killamarsh Gas Company were summoned for supplying gas, for a longer period than two hours, which was more than 5 p.ct. below the required calorific value.

On behalf of the County Council, Mr. H. W. SKINNER said that the Eckington and Mosbrough Gas Company obtained an Order in 1921, and gave notice to supply gas of 480 B.Th.U. per c.ft. If the Company did not reach that standard by a certain percentage for a period of two hours per day, they were liable to a forfeiture of £1 for every 1 p.ct. deficiency. Under a section of the Act, they were allowed a margin of error which brought the calorific value to 450 B.Th.U. before they were liable to forfeiture. The Eckington and Mosbrough Gas Company had declared a calorific value of 480 B.Th.U., and they were under an obligation to supply up to this standard.

Mr. *John White* (the Gas Examiner to the County Council) stated that he tested the gas of the Eckington and Mosbrough Company and found that the mean calorific value at 2.45 p.m. and 4.10 p.m. on Nov. 23 last was 441·2 B.Th.U. Witness admitted that the average for the quarter in which the test was made was well above the required standard.

For the defence, Mr. SCORAH explained that the Eckington and Mosbrough Gas Company got their gas from Holbrook Colliery, and he urged that both the quantity and quality of the gas supplied depended upon the state of the machinery at the colliery. The average calorific value of the gas supplied throughout the quarter in respect of which the summons was issued was 496 B.Th.U. as against the 480 B.Th.U. required; but on the day on which the test was made there was an armature burnt-out at the colliery. This breakdown took seven hours to put right, and caused the drop in the calorific value. In such circumstances there should be no forfeiture insisted upon.

Robert C. Greensmith (the Manager of the bye-products plant at the Holbrook Colliery) said that on Nov. 23, when the test of the gas was made, there was a breakdown which threw fifteen ovens out of action.

The Magistrates considered that, while it was a proper case for the County Council to bring, the circumstances were beyond the control of the Company, and they dismissed the case.

As the Killamarsh Gas Company also obtained their supplies from the Holbrook Colliery, and in view of the Magistrates' decision, Mr. Skinner withdrew the case against them.

The Killamarsh Gas Company were also summoned for supplying gas which contained sulphuretted hydrogen, in contravention of the Act. After hearing the evidence, the Bench imposed a fine of £5.

Thefts from Prepayment Meters.

At the Hanley Police Court, Daniel Heath pleaded guilty to having stolen 25s. from a prepayment meter, the property of the Stoke-on-Trent Corporation. It was stated that, when an inspector went to examine the meter, he found the padlock had been tampered with, and there was only £1 1s. 4d. in the money box, the deficiency being £1 5s. Defendant expressed his regret for the offence, which he stated was committed while he was under the influence of drink. The Bench decided to take a lenient view, and bound him over for twelve months —ordering him to refund the 25s., and pay the costs. At the Tunstall Police Court, Leonard Burgess was summoned for stealing 26s. from a gas-meter, and doing wilful damage to the lock, the property of the Stoke-on-Trent Corporation. He admitted having damaged the lock, but said he took only 4s. of the missing money. Mr. G. C. V. Cant (for the Corporation) stated that similar cases were occurring in all parts of the borough, and he hoped the Bench would take the most serious view they could. An inspector said that, instead of the meter containing £1 11s. 7d., there was only 5s. 7d. in the box. The Bench imposed a fine of £5 for the theft, and on the other charge defendant was ordered to pay the costs.

MISCELLANEOUS NEWS.

PRIMITIVA GAS COMPANY OF BUENOS AIRES, LTD.

Capital Re-organization Scheme Agreed to.

Extraordinary meetings of the shareholders in the Company were held at River Plate House, Finsbury Circus, London, on Tuesday of last week—Sir ALBERT E. BOWEN, Bart. (the Chairman), presiding—for the purpose of considering resolutions for the reduction and re-organization of the capital of the Company.

THE SCHEME.

With the notices calling the meetings, a circular was addressed to the shareholders pointing out that on several occasions during the last few years proprietors had suggested at general meetings of the Company that the capital should be re organized, but the Board had hitherto been of opinion that an opportune time for such a step had not arrived. The Board considered that a re-organization was now imperative, that the heavy losses sustained by the undertaking during the war and subsequently must be written off, and the capital be reduced to figures more commensurate with the Company's earning power. In view of the fact that the superior officers of the Company in Buenos Aires had recently been changed, it was, of course, desirable that every encouragement should be given to the new management, and it was abundantly clear that the task of earning dividends on the present capital was an impossible one to expect the new officers to attempt. The following items shown by the balance-sheet of the Company as at Dec. 31, 1922, represented losses suffered by the Company at that date:

Debit to profit and loss as at Dec. 31, 1922 . .	£456,600 7 10
Retiro works amortization account and expenses entailed by the amalgamation of the Companies	644,329 9 8
	£1,100,929 17 6
Since that date further trading losses have been incurred, and, in addition to these losses, the Board were of opinion that, owing to conditions in recent years, serious depreciation has taken place in various assets of the Company. For these reasons, the Board considered that a further sum should be written off capital amounting to at least	559,426 2 6
Total	£1,660,356 0 0

The circular went on to say that, apart from these losses, there were accumulated arrears of preference dividends to Dec. 31, 1923, amounting altogether to £1,000,000 (free of income-tax). The Board saw no prospect whatever of the Company being in a position to discharge so heavy an obligation, the continuance of which must seriously hamper their future development. They were therefore of opinion that the preference shareholders should, as part of the scheme of reorganization, forego payment of such arrears. The Board proposed to write-off the sum of £1,660,356, by means of the following reductions of capital:

The 5 p.c. cumulative preference shares (issued or agreed to be issued) to be reduced from £5 to £4 per share—a reduction of £1 per share on 500,000 shares—and converted into ordinary shares of £1 each reduction	£500,000
The ordinary shares (issued or agreed to be issued) to be reduced from £5 to £1 per share—a reduction of £4 per share on 290,089 shares . . . . reduction	£1,160,356
Total reduction	£1,660,356

The effect of this would be to reduce the capital of the Company to £2,339 644, divided into this number of £1 ordinary shares. Under the scheme, the present preference shareholders would retain capital rights in the undertaking to the extent of 87·33 p.ct. of the whole issued capital, and the present ordinary shareholders' interest in the capital would be reduced to 12·66 p.ct. These proportions were considered by the Board to be fair to both classes of shareholders. Under the Articles of Association, the Board might issue debentures or debenture stock to an amount not exceeding 50 p.ct. of the issued share capital for the time being. On the amount of the present issued capital, there was a balance of such borrowing power remaining unexercised to the extent of some £500,000. Upon the reduction of capital becoming effective, the power to issue this balance would be lost, and the Board therefore submitted a resolution to enable them to issue further debentures or debenture stock (if, and when, they considered it in the interests of the Company to do so) not exceeding, with the existing debentures and debenture stock, the amount of the issued share capital as reduced.

The SECRETARY (Mr. J. M. Macmorran) read the notice convening the meeting, and the series of resolutions to be submitted for carrying into effect the scheme outlined above.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN said that since the general meeting last July, a good deal had happened in connection with the Company. The principal officials in Buenos Aires had been changed; a thorough re-organization of the personnel had been carried out; the expert to whom he had referred in his last address had joined the local Board; and they were gradually getting the ship into better trim. One piece of bad luck they had had was that the gentleman who had been appointed as General Manager had fallen ill, and decided that he could not take up the position. This was a great disappointment, as he was highly qualified for the post, which was a difficult one to fill after what had happened during the last ten years. They were looking out for somebody else, and meantime the new Chief Engineer (Mr. Stevenson) was in charge, and everything was working smoothly. Since his (the Chairman's) return from Buenos Aires, he had given a great deal of his time to the re-organization of the staff, and had also devoted much thought to the best means of getting the capital account into better shape. Many times at general meetings of late years the shareholders had urged upon the Board that a thorough re-organization of the capital was advisable, and indeed necessary. He had at different times drawn up at least six schemes; but he had always turned them down, because the time did not seem to have come when any good purpose would be served by radically altering the existing condition of things. However, after his visit to Buenos Aires last year, and the change of the old personnel which came from it, he at last arrived at the conclusion that it would dishearten the new men in charge if they had to try to earn dividends on capital which the war and its aftermath caused the Company to lose; and besides this, the credit of the Company was seriously prejudiced by the lamentable state of the balance-sheet.

To draw-up such a very drastic scheme of re-organization as that now proposed was very anxious work. The Directors had had the advantage of consulting with some of the best financial authorities in London, and of getting their advice. They had, of course, had the expert assistance of their Auditors (Messrs. George A. Touche & Co.), and naturally they had taken the best legal advice to be obtained. It was no use disturbing the condition of things unless a thorough weeding-out of all bad or non-existent assets was made; hence the very large amount of capital it was proposed to write-off. Perhaps the most anxious part of the work in drawing-up a scheme of this kind was to hold the balance equally and truly to the best of one's powers between the two classes of shareholders, ordinary and preference. The obligation, of course, was to see that the preference shareholders should not be asked to give up as much as they were asked to do without the ordinary shareholders contributing their full share. As it was, the Board proposed that the preference shareholders should take 87·33 p.ct. of the equity of the business, whatever it might be worth, the remaining 12 66 p.ct. going to the ordinary. Before this re-organization, the preference capital represented 63·3 p.ct., while the ordinary had 36·7 p.ct. The Directors were advised, and they thought, that it would not be possible to wipe out the ordinary shareholders entirely, because they would not consent to the re-organization scheme, and it would not be worth their while to take less than 12·66 p.ct. It was an old saying that it was impossible to please everybody; so, as there had been grumbling letters from both preference and ordinary shareholders, it might be taken that the scheme did not err on the side of giving an undue advantage to either class. Several shareholders had asked why the debenture holders were not required to make some sacrifice; but this, of course, was impossible, as they had mortgage rights over the whole of the assets. Some few preference shareholders had also grumbled at being asked to forego the £1,000,000 of accumulated preference dividend, and there had been suggestions that deferred certificates of some kind should be issued up to (say) half of this amount to the holders of preference shares. But there was no asset to set against that, and it would seriously prejudice not only the credit of the Company, but the value of the new ordinary shares themselves, which the preference shareholders were asked to take in place of their existing shares. Nobody could get more out of the business than it would give; and the hope, of course, was that, once this drastic re-organization was out of the way, the Company would begin to earn profits, and be able to pay some sort of dividend on the new ordinary share capital.

As he had explained many times before, the Company's trouble was that during the war they not only lost all their working capital, but also lost the consumers. They were not in a position properly to maintain the works, which were seriously damaged owing to the Company being obliged to make gas out of cereals, timber, old bones, &c. All this had to be put straight before they could hope to do any good and take advantage of the monopoly they held for gas-making in the great city of Buenos Aires. The Company were seriously in need of working capital; but he felt convinced that they had turned the corner, that they would be able to make profits, and that the undertaking would soon be properly on its legs again. The new brooms were sweeping with great energy, and there was a good deal of dust to be shifted. There was no intention whatever of further preference shares being put in front of the new ordinary shares proposed to be issued. All the Directors asked the shareholders to do was to increase the borrowing powers—not that the Board had the slightest intention of selling any debentures or making any issue, because this would be ruinous at the price at which they now stood in the market; but if there was authority to increase the debenture issue, this power could be used as collateral for any borrowings arranged with the bankers. He had served these amalgamated Gas Companies since 1883; and up to 1914, when the war broke out, it was all profit and good dividends, and everything was very pleasant at the general meetings. Since then it had been a heartbreaking job to keep the business going. He had had to use his own money and credit at times, in order to carry on from day to day. This meeting was the worst experience he had had in all his forty years' connection with the business, and he could only hope that future meetings might be more pleasant, and that he would have pleasant news for them each time. That the business was a really good one, he had never hidden from himself or from them. It was ruined by the war, which nobody could have foreseen, and by the fact that the Municipality of Buenos Aires, in what they understood to be their duty to the people, forced the Company to carry out their contract to the bitter end. It was only when he went out in 1919, and made it perfectly clear to the authorities that they would be obliged to shut-down for want of money, that he got the new contract under which they were working. Several shareholders had said: "But why on earth didn't you shut-down in 1915, 1916, or 1917, when you could not get any coal? You had a perfectly good excuse for doing so, as you could not secure coal at any price. You would have saved the serious damage to your retorts and machinery, and would have saved money." The Board many times considered this; but the result would have been the forfeiture of the concession, probably the taking-over by force of the works, and the complete elimination of any possibility of future business or profit. How they managed to get through the war years, he really did not know. He was, however, convinced that, if this scheme went through, unless anything unforeseen happened, they would return to the dividend-paying stage within a short time. He certainly intended to do all he could to pull the

Company round, and this re-organization scheme was his first and most essential contribution to the future prosperity of the Company. He concluded by moving the resolutions necessary to carry the scheme into effect.

Mr. H. E. JONES (the Vice-Chairman), in seconding, said that, from his long experience, he could assure them that there was a splendid future for gas in Buenos Aires. Gas was never in a better position than it occupied to-day. The war had, however, disabled them specially in Buenos Aires. They had the alternative of paying out 700 or 800 p.ct. more than the gas would sell for under the concession; they had the alternative of using materials which were injurious and which so far impoverished the gas that it became out of favour with the consumers; and they had the alternative of shutting-down the works and losing everything. After much anxiety and unparalleled effort on the part of their worthy Chairman—the Board assisting to the best of their ability—they weathered that storm, only to find the peace little better than the war, except for the fact that the emergency was passed, and they must be approaching a more satisfactory condition of affairs. They had called to their counsels out in Buenos Aires a gentleman who possessed the very highest ability in gas service, who had had the highest possible training, and whose integrity was absolutely beyond suspicion. Personally, he (Mr. Jones) had the greatest confidence in the future of the Company. They had, as the Chairman had told them, turned the corner, but they would have to put their finances in better shape.

The CHAIRMAN, in the course of his reply to a number of questions by shareholders, said the Company were now on very good terms with the Municipality. The latest figures showed a total of 34,000 consumers, and there had been an increase of 1800 in the last six months, in which time they sold 15 p.ct. more gas than in the corresponding period of the previous year.

Shareholders who spoke agreed that the scheme was the best that could be suggested in the circumstances, and the resolutions were agreed to with practical unanimity.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade for Orders under the Gas Regulation Act.

DECLARATIONS OF CALORIFIC VALUE.

Petersfield and Selsey Gas Company.—450 B.T.U. in the Petersfield district, and 475 B.Th.U. in the Selsey district. (March 25)

Portmadoc Urban District Council.—450 B.Th.U. (Feb. 18.)

GAS REGULATION ACT ORDERS.

We have received from the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Arbroath Corporation.

The Order contains the usual clauses, without mention of any particular price for gas. (Jan. 23.)

Hertford Gas Light Company.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16d. per therm. (Jan. 25.)

Marple Urban District Council.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 14·4d. per therm.

Prepayment meter clauses are included. (Jan. 24.)

Price of Gas Reduced at Stalybridge.—An effort is being made by the Stalybridge Corporation to increase the use of gas among householders in the town. At the meeting of the Town Council recently, the Chairman of the Gas Committee (Councillor J. W. Greenwood) announced that they were able to reduce the price of gas by 3d. per 1000 c.ft., making a reduction of 9d. altogether within the last nine months, and bringing down the price to 3s. 3d. net per 1000 c.ft. The present gas-works, he stated, were capable of turning out double the quantity now made; and greater consumption meant cheaper gas. During the last nine months the amount of gas sent out was nearly 2 million c.ft. more than in the corresponding period last year.

Benzole and Bye-Products.—The net profit of this firm for the period of eighteen months ended Sept. 30, 1923, totalled £47,934, arrived at after providing for depreciation and all other charges, setting aside £8000 for income-tax, and deducting the adverse balance of £1965 brought in. The profit compares with a trading loss of £44,494 for the year ended March 31, 1922. The preference dividend, at the rate of 6 p.ct. per annum, has been paid to Sept. 30, 1923, leaving £40,013 to be carried forward. The Directors state that they are satisfied that ample provision for depreciation has been made, and that, while the Company have no bank overdraft or other charges upon the undertaking, the present liquid position is the strongest in the Company's trading history.

Big Demand for Gas Appliances in Birmingham.—The Birmingham Gas Department took the opportunity, when sending out the accounts for the Christmas quarter, of informing customers, through a special circular, of the fact that since the previous invoice was presented a reduction of 6d. per 1000 c.ft. had been made, and that a further reduction of 3d. per 1000 c.ft. came into effect after the December reading of the meters. There followed a statement as to the phenomenal rush of orders for gas-apparatus—particularly gas-fires—and anticipation of big orders in the early spring; and then an invitation to the gas users to inspect designs of appliances at the Birmingham Council House, or to call for the services of a technical man if the gas supply was not all it should be.

THE RAMSAY MEMORIAL LABORATORY.

At University College, London, on Thursday, Jan. 17, there was given the public inaugural lecture on "The Aims and Future Work of the Ramsay Memorial Laboratory of Chemical Engineering," by Prof. E. C. WILLIAMS, who has been appointed to the Chair. The Ramsay Memorial Committee allocated half the total sum collected, or about £26,500, to scholarships, and the other half to the foundation of a Ramsay Memorial Laboratory of Chemical Engineering, in the college where the late Sir William Ramsay worked. An additional income of about £2000 a year is needed to enable a start to be made; but most of this, for a period of five years, has been promised.

In the course of his address, Prof. Williams stated that the general scheme of instruction in the Department will be arranged under the following main groups of subjects:

1.—The generation and distribution of energy. It is not intended to deal in detail with the actual design of steam boilers, electrical generators, or motors, except in so far as this knowledge is required in order to choose such plant intelligently, and to operate it efficiently and economically.

2.—The transference of energy to materials. This will be treated from the fundamental thermo-physical point of view in the first place, after which will follow detailed investigations of the various types of apparatus used industrially for the transference of heat to materials.

3.—Section 3 will deal with the handling and transportation of materials; the physical laws controlling the flow of liquids and gases through pipe lines; the effects of friction and viscosity of fluids on the power required to pump them; and the calculation of the cost of such transference. It will also include illustrations of the main types of apparatus used for the pumping, lifting, or conveying of materials, and the principles which govern the choice and lay-out of transportation systems.

4.—This section is mainly intended for students who have had little or no engineering training, and is designed to give them a knowledge of those branches of mechanical and constructional engineering which are required in the design and erection of plant. It will also include classes in engineering drawing and the use of engineering tools.

5.—This deals with the preliminary preparation of materials for use in chemical operations, and treats of the physical principles of operation and of the common types of plant employed for such operations as the crushing, grinding, mixing, and classifying of solids.

6.—This section is devoted to familiarizing the student with the chief measurements and instruments used in the control of works plant and processes, other than methods of analytical chemical control.

7.—One of the most considerable sections in extent and most important in content will deal with the design and operation of specific unit types of chemical plant and processes. It is the intention to deal, not with particular technical processes, so much as with the fundamental physical and physico-chemical principles underlying each specific operation. The operations may be classified generally as physical or chemical. The former consist mainly of processes of separation, whether of solids from solids, solids from liquids, liquids from gases, or of mixed liquids and mixed gases. For the second group, or chemical-type operations, design of plant is also governed by an accurate investigation of heats of reaction, chemical equilibria, velocity of reaction, effect of the state of division of the reacting materials, and of speed of agitation or intimacy of contact. It is proposed to deal with the manner in which these various factors affect and control the arrangement of plant required. There is to be included in the Department a large laboratory for the erection of plant of a semi-scale nature. It is not intended that this shall be a museum for the display of working models of industrial plant, but rather a flexible workshop provided with all necessary services of water, vacuum, compressed air, steam, gas, and electric power, in which, as occasion demands, they can build-up any unit or sequence of units for the demonstration or investigation of particular problems, in apparatus of the same type as would be used on the large scale.

8.—This section may be called the "Correlation of Chemical Process and Unit-Type Operation to form the Complete Industrial Process"—*i.e.*, the method by which the chemical engineer should proceed in the drawing-up of a scheme for the lay-out of plant for a complete chemical process.

Finally, it is proposed to include in the course lectures designed to give some insight into certain branches of general industrial economics.

Price of Gas at Killamarsh.—At a meeting of the Killamarsh Parish Council last Friday, it was reported that a letter had been received from the Killamarsh Gas Company, in reply to a communication from the Council asking for a reduction in the price of gas, which is at present 6s. per 1000 c.ft. to private consumers. The Company stated that the request of the Council would be considered.

Lighting Trades, Ltd., Staff Dinner and Dance.—By invitation of the Directors, the staff of Lighting Trades, Ltd., of Garratt Lane, Wandsworth, S.W., to the number of 140, were, on Thursday last, entertained at a dinner and dance in the Princes Hall of the Hotel Cecil. Mr. H. J. Mitchell (the Chairman of the Company) presided at the dinner, and was supported by the other members of the Board. During the musical programme which followed, Mr. Mitchell expressed the pleasure it afforded him and his fellow Directors to welcome the members of their staff round the festive board. In a short speech dealing with the position of the Company, he took occasion to remark, anent the troublous times through which they had passed, that they had now turned the corner, and, given a continuance of that support which they had always received from the staff, he thought the outlook for the Company was particularly promising. Mr. Dixon and Mr. A. T. Metcalfe (the General Manager) returned thanks on behalf of the staff at the works and head office respectively. Mr. Metcalfe, in proposing the toast of "The Chairman and Directors" (which was accorded musical honours), expressed the hope that the dinner and dance might become an annual affair. Well-merited thanks were accorded from the Chair to Messrs. Marrable and Martin and Miss Cottrell, for the excellent manner in which the programme had been carried out.

STANDARDIZATION OF COLLIERY REQUISITES.

Economy in the working of our coal mines is of paramount importance—a fact which is self-evident when it is remembered that the rate of percentage increase in the miners' wages depends upon the difference in the cost of production and the selling price of the coal.

We understand that, at the request of the Mining Association of Great Britain, the British Engineering Standards Association have undertaken the standardization of colliery requisites; and the progress of this work will undoubtedly be watched with keen interest by the country as a whole. In this connection a fully representative Committee is being set up under the Chairmanship of Mr. Evans Williams, the President of the Mining Association, who are contributing to the funds of the British Engineering Standards Association, to enable this important work to be carried out on an adequate basis.

Local committees are to be instituted in the various centres, to study the details of the subject; and it is intended by this means to make the fullest use of practical knowledge—that knowledge so fully possessed by those in daily contact with the apparatus and equipment being studied.

In order, too, that concrete results may be obtained without undue delay, the committees are to concentrate their attention on a limited number of the more important questions—such as pit tubs, rails, and rope sheaves, of which there is far too great a variety of types in existence.

Millions are expended annually in the replacement of the various articles which go to make up the equipment of a colliery; and it is easy to see that even a small percentage saving on these will represent a substantial sum of sufficient importance to be reflected in the costs of production. We are confidently expecting that the "B.E.S.A.," who have done such excellent work through the standardization of steel sections and tramway rails, will do similar good work in this connection. One of the most valuable results to be looked for through the interchangeability of the standards will be quick deliveries, ease of replacement of damaged parts, and an open market for supplies.

The Association, in unifying the needs of the industry—which, after all, is the fundamental significance of standardization—will be doing much through the elimination of waste time and material; and both the Mining Association of Great Britain and the "B.E.S.A." are to be congratulated on the promotion of this co-operative movement, which has such vast possibilities for the good of the coal industry and the nation at large.

TRADE NOTES.

Messrs. Simon-Carves, Ltd., and the Wembley Exhibition.

With a view to giving such support as is in their power to the British Empire Exhibition, and in appreciation of the satisfaction which they feel towards their staff generally, the Directors of Messrs. Simon-Carves, Ltd., are inaugurating an excursion to Wembley, in the first week of June, for the whole of their employees. The firm intend to provide a special train, with meals on route, and admission to the Exhibition.

Dry Quenching of Coke.

The Semet-Solvay and Piette Coke Oven Company, Ltd., of No. 155, Norfolk Street, Sheffield, have recently issued a brochure in which a description is given of the Sulzer process for the dry quenching of coke—for which the firm have acquired the patent rights so far as they relate to the manufacture of metallurgical coke in this country. The descriptive matter is an abstract from an article by Dr. P. Schläpfer, of Zurich, published in "Stahl und Eisen." Readers of the "JOURNAL" will probably remember that an abstract of this article was given in the issue for Jan. 31, 1923, p. 266.

Aldershot Gas, Water, and District Lighting Company.

At the annual general meeting to-morrow, the Directors will report that the business in all departments is very promising. The accounts for the year ended Dec. 31 last show that the revenue from all departments was £177,821, and the expenditure £147,837, leaving a surplus of £29,984. After allowing for dividends on the consolidated preference stock and interest paid to the bank and on redeemable mortgage bonds and debenture stock, as well as the statutory interim dividends paid for the half-year ended June 30 last—namely, £6 13s. p.ct. per annum on the "A" stock, £5 3s. p.ct. per annum on the "B" stock, and £5 p.ct. per annum on the "C" stock, the Directors recommend statutory dividends of £7 5s. p.ct. per annum on the "A" stock, £5 15s. p.ct. per annum on the "B" stock, and £5 p.ct. per annum on the "C" stock, for the latter half of the year—all less income-tax. Since the coal strike—Midsummer, 1921—the price of gas has been reduced in the "A" area by 30 p.ct., in the "B" area by 31·4 p.ct., in the "C" area by 29·3 p.ct., and in the "D" area by 29·3 p.ct. The Directors regret to report the death, on May 7 last, of Mr. W. T. Robertson, J.P., C.C., who had been a Director from 1898, and Chairman from 1912 to 1919. Mr. Robertson rendered valuable services to the Company, and it has been suggested that a suitable panel should be erected in the Board-room to his memory, as well as one to the previous Chairman, Mr. A. F. Wilson. Attention was drawn in last week's "JOURNAL" to the prompt closing of the accounts for 1923, and to the fact that the meeting was to be held on Jan. 31, with dividends payable on Feb. 1. While the preparation for this payment of dividends is, of course, a matter for the department of the Secretary (Mr. F. A. Ricketts), the preparation of the annual accounts is entirely in the hands of the Chief Accountant (Mr. E. Hortop, A.S.A.A.), to whom the credit is due for the promptness in this respect on which we commented.

The Droitwich Town Council have decided to reduce the price of gas 4d. per 1000 c.ft. as from the end of December. This brings the price down to 3s. 8d. per 1000 c.ft.

THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

As was only to be expected, the market has been thrown out of gear by the railway trouble. Collieries in these parts have, for the most part, very poor storage facilities. The lucky few have direct connection with loading places of their own. The majority are dependent largely upon a hand-to-mouth system by which the railway company leads out a full train of coal and deposits a corresponding train of empty trucks into which coal is loaded direct from the pithead. Thus, any sudden disorganization of railway traffic is apt to leave pits "high and dry." On the whole, the service has, however, been very good, considering all the difficulties; and it was estimated at the end of the week that shipments had reached about 80 p.ct. of the normal. Some pits have been laid idle odd days during the week, which is hard lines on the miners. But the railway company have gradually organized their available engine power, and work at the pits has been able to proceed better than might have been expected.

Collieries, however, have not been able to see far ahead, or promise loading turns with any degree of certainty, so that new business has been practically at a standstill. A few odd lots were sold at the beginning of the week to complete cargoes, and fancy prices are said to have been paid to those who had any coal available. Bunkers have been dealt in most, and these have been done at about 26s. to 27s. 6d., which may be said to be approximately the nominal market quotation for most sorts of coal.

There is a great deal of inquiry about for various periods forward, and there is every indication of a strong market when matters settle down again.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

The railway strike has caused considerable inconvenience in the transport of coal in Yorkshire and Lancashire. At the week-end, some railway companies were not in a position to deal with traffic for the large consuming areas, while others, by keeping full train loads moving, had prevented any inconvenience to certain sections of the public. At the time of writing, collieries generally regard the position with apprehension, in view of the shortage of empties—particularly those pits situated on rail entirely, as the collieries which have a canal traffic are better placed. The position is one of uncertainty, and may alter within a very short period. Some collieries report having to close down, while others state they are working full time. Prices are equally uncertain; some pits having taken advantage of the position to create new advanced figures, while others are continuing supplies to their old customers at contract or pre-strike quotations.

The gas coal market is undoubtedly unsettled, but the stocks available should prevent any inconvenience to the public for some weeks. Several industries appear to be busier than they were some weeks ago, but whether this is a permanent or only a temporary improvement remains to be seen.

The shipping industry is nearly at a stand-still for rail supplies at Hull, where the men are in sympathy with the strikers. Limited supplies are being dealt with by compartments at Goole, in accordance with the ships that are available; and it is to be hoped there will not be congestion at this port to prevent export, so as to enable certain collieries favourably situated to continue working.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The interruption of deliveries through the railway strike has involved gas engineers in a very anxious plight. In the circumstances the railways have done remarkably well, but it was inevitable that congestion at key centres should become aggravated with the prolongation of the conflict. It has been increasingly difficult to get trains through from Yorkshire, Nottinghamshire, and Derbyshire to the South-West Midlands; and the curtailment of the output of gas is a contingency which is entering into the calculations of some of the big undertakings. Deliveries were already in arrear when the strike took effect; and while there is no actual dearth at the time of writing, reserves have been seriously depleted. The foresight and energy with which dispositions were made when the trouble became imminent neutralized disorganization to a great extent in the early stages of the strike; but delays in getting wagons to and fro involved increasing irregularities both at the pits and in transit as it proceeded. In the district between Stafford and Rugby the industrial centres, including Birmingham, were favourably situated in regard to the general fuel supply, inasmuch as they received a large amount of local coal which with free transport conditions would have gone to London. By making full use of the canals and of road transport, a big tonnage was distributed. The main mischief to productive industry arose through the shortage of coke. Several blast-furnaces had to damp-down, and manufacturers who rely upon gas coke were also stopped temporarily in individual cases. Premiums of 5s. to 6s. over the prices previously ruling were paid for household coals. Slacks, nuts, and other industrial grades advanced 2s. to 3s.

New Plant at Oswaldtwistle.—The report of the Gas-Works Sub-Committee appointed to consider the question of providing new plant at the Oswaldtwistle Gas-Works, and the purchase of the offices of the Oswaldtwistle Collieries, for gas showrooms and workshops, has been accepted; and the schemes will be undertaken.

Price of Gas Reduced at Ashton-under-Lyne.—The Directors of the Ashton-under-Lyne Gas Company, who supply the town and some of the outlying districts, announce that from the reading of the meters for the December quarter the price of gas will be reduced to 9·4d. per therm. This is equivalent to a reduction of 3d. per 1000 c.ft.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 28.

In the London market the position of pitch is quite nominal, no business of any importance having been reported for some little time. Creosote is steady at about 10d. net per gallon in bulk at makers' works. There is an increasing demand for motor benzole, no doubt in consequence of the railway strike.

Tar Products in the Provinces.

Jan. 28.

The average values for gas-works products during last week were: Gas-works coal tar, 57s. 6d. to 62s. 6d. Pitch, East Coast, 80s. to 82s. 6d. f.o.b. West Coast—Manchester, 77s. 6d. to 80s.; Liverpool, 78s. 6d. to 81s.; Clyde, 79s. 6d. to 82s. Benzole 90 p.ct., North, 1s. 0½d. to 1s. 1d.; crude 65 p.ct. at 120° C., 9½d. to 10d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 5d. to 1s. 7d. Toluole, naked, North, 1s. 4d. to 1s. 5d., nominal. Coal tar crude naphtha in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 11d. to 1s. 1d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, liquid, 8⅝d. to 9d.; salty, 8½d. to 8⅝d.; Scotland, 8½d. to 8⅝d. Heavy oils, in bulk, North, 9d. to 9¼d. Carbolic acid, 60 p.ct., 2s. 1½d. to 2s. 4½d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Manchester District Tar Prices.

Our correspondent for tar prices from the Manchester district writes: The average price realized for the sale of tar, according to the sliding-scale, for the month of December, was £4 18s. 5·62d.

The Directors of the Tottenham District Light, Heat, and Power Company recommend the payment of dividends in respect of the half-year ended Dec. 31 at the rate of 5 p.ct. per annum on the preference stock, 8 p.ct. per annum on the "A" stock, and 6½ p.ct. per annum on the "B" stock—all less income-tax.

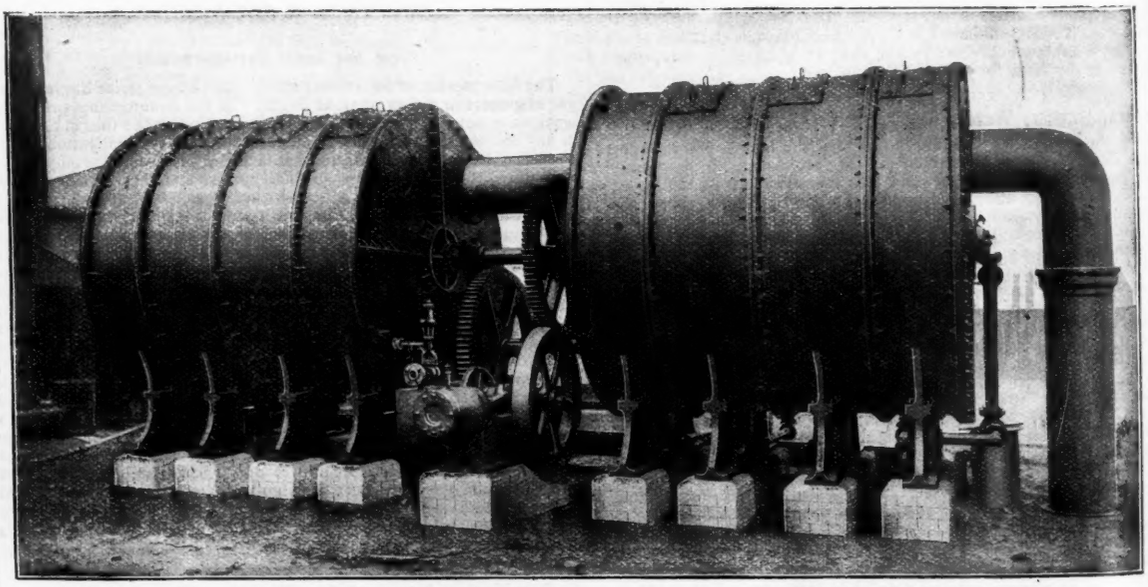
The Shipley District Council have completed accommodation for baths and changing of clothing for the employees at the gas-works. This accommodation hitherto has been very inadequate, but the Council have now converted three cottages near the retort-house to the required purposes, as a result of representations on behalf of the men by Mr. H. Burton, the Gas Engineer. On the 23rd inst., a little supper party was held to celebrate the opening.

British Industries Fair.

The forthcoming British Industries Fair, which will be held at the White City, London, from April 28 to May 9, and at the Castle Bromwich Aerodrome, Birmingham, from May 12 to 23, should establish a record for the numbers of trade buyers visiting it from all parts of the country. By a special arrangement between the railway groups and the Department of Overseas Trade (the organizers of the fair), visitors will be able to make the return journey from anywhere in Great Britain at a cost of one-and-a-third of the ordinary single fare. Such action by the railway companies is a striking pronouncement of their belief in the fair as an important factor in the creation of national wealth, and should play a considerable part in augmenting the volume of business done. The forthcoming fair will be the tenth of an unbroken series organized by the Department of Overseas Trade, and has already engaged the attention of numerous business men who have arranged to come to this country for the opening of the Wembley Exhibition. It is exclusively a trade fair, and has come to be recognized by overseas buyers throughout the world as one of the most important events in their commercial calendar, because it brings together the displays of the principal manufacturers in practically every trade, and so enables trade buyers to do a year's buying in comfort and economy within a week. As in previous years, heavy products—such as engineering appliances and building materials—will be shown at the fair to be held in Birmingham, the lighter commodities being displayed at the White City. Full particulars, and forms of application for space, can be obtained from the Secretary, British Industries Fair, Department of Overseas Trade, Old Queen Street, Westminster, S.W. 1.

Providence (R.I.) Gas Company's Progress.—The Providence (R.I.) Gas Company have just celebrated their 75th birthday. In 1848, when the undertaking started business, the city possessed 40,000 inhabitants; but thirty-seven years later this number had grown to 125,000, and the annual sales of the Company had reached a total of 319,279,200 c.ft., or 2550 c.ft. per head of the population. At the present time, the population of the area supplied by the Company is no less than 310,000, and the annual sales are 2,600,000,000 c.ft., or 8390 c.ft. per head—an increase of 229 p.ct. The Gas Company, according to Col. Oscar H. Fogg (who has just resigned the position of Secretary-Manager to the American Gas Association), have not only kept pace with this growing demand, but have anticipated and prepared themselves in advance to meet public requirements. Gas has, in fact, been made so necessary to the citizens that it is used in increasing volume year after year; but, what is equally important, the mains and services have reached out into the suburbs, encouraging the population of those outlying sections, and putting the best that the art had developed at the disposal of both homes and factories. They did not have to wait for this service to be established after long delay; these facilities and conveniences had been planned out in advance, and were ready and waiting when needed.

ROTARY SCRUBBER WASHERS



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Sensible Heat Distillation, Ltd., has been registered as a company, with a capital of £35,000, in 17,500 50 p.ct. preference shares of £1, and 350,000 ordinary shares of 1s.

Waterford Gas Company.—The accounts of the Company to June 30 last show a credit balance of £8470. The Directors have declared a final dividend of $2\frac{13}{16}$ p.ct., making $5\frac{7}{8}$ p.ct., and have carried forward £4636.

Dumbarton Gas-Works.—The Dumbarton Town Council have agreed to borrow £17,000 towards the cost of the new gas-works and the alterations at Garshake House. The Provost stated that the total cost of the new gas-works was £133,267.

Air Raid Damage to Retford Gas-Works.—At a meeting of the Retford Town Council last Friday, a tender was accepted for the repair of a spiral holder at the gas-works, and for a new inner lift; the total amount of the contract being about £11,270. It was explained that the spiral holder was damaged during an enemy air raid in the war.

Blackpool Gas Undertaking.—The Blackpool Corporation Gas Department are in a favourable position for coal; the stock in hand being sufficient for five or six weeks. The progress made by the department during the last years is shown by the following comparative statement. For the year 1913, the output was 671,198,000 c.ft. The total for 1923 was 893,637,000 c.ft.—an increase of 222,439,000 c.ft., or 33·14 p.ct.

Edinburgh Gas-Works Extension.—A scheme for the adoption of new plant at the Edinburgh Corporation Gas-Works at Granton, at an estimated cost of from £150,000 to £180,000, will come before the Town Council in the near future. The proposal is to replace the present plant by the vertical-retort system; and a Sub-Committee of the Gas Committee last week agreed to recommend in favour of the scheme. Mr. H. H. Gracie, the Engineer and Manager, states in a report that information regarding the cost of working shows a saving—after allowing for capital expenditure—of about 1½d. per 1000 c.ft., to which should be added ½d. representing the saving by the use of a cheaper quality of coal. This is approximately equal to £20,000 a year.

A Gas Company's Tenancy Question.—At the Midleton (co. Cork) District Court, an interesting point arose in a case by the Midleton Gas Company to recover possession of a house occupied by an ex-stoker. It appeared the Company had deducted 2s. 9d. from the defendant's weekly wages as rent, and when he left the employment he refused to yield possession on the ground that he was a legal tenant. It was now argued that the weekly deduction established a contract of tenancy. The District Justice held that the contract with the Gas Company was a contract of service, defendant's remuneration being wages *plus* the use or occupation of the house, and that, as in the case of a caretaker or herdsman, defendant should vacate the place on terminating his employment.

The Whitchurch (Salop) Gas Company announce a reduction of 1d. per therm dating from Jan. 1. This means a reduction of 5d. per 1000 c.ft.

It was reported at a meeting of the Matlock Bath Council on Friday that the make of gas for last December had decreased by 7·9 p.ct., as compared with December, 1922.

With a view to finding work for the unemployed, the Gas Committee of the Walsall Town Council are recommending that, to supplement the supply of gas to the Bloxwich district, a new gas-main be laid, at a cost of £1688.

The Barrow Corporation Gas Committee, it is understood, have decided to instal plant to provide a better quality of sulphate of ammonia, with a view to a material extension of the market for this commodity among the district agricultural and horticultural population.

On Wednesday, the 16th inst., the Salford Fire Brigade were called to Lord's Tar-Works, at Weaste, and found three stills on fire. The flames were extinguished by the use of "fire snow" in less than half-an-hour. The conflagration did not extend to any other part of the works.

The Directors of the Newcastle-upon-Tyne and Gateshead Gas Company have resolved to recommend to the proprietors, subject to audit, the payment of final dividends for the year ended Dec. 31, 1923, as follows: 2 p.ct. on the preference stock, making 4 p.ct. for the year; and £2 11s. 3d. on the ordinary stock, making 5 p.ct. for the year.

After much discussion, the Blackpool Corporation decided to advertise the position of Gas Engineer and Manager, rendered vacant by the death of Mr. William Chew. The salary is £800 per annum. The Committee thought it inadvisable to establish a precedent by appointing a new official without throwing the vacancy open to competition.

The Spenborough Urban District Council have established new and well-appointed gas showrooms in Albion Street, Cleckheaton (Cleckheaton being one of the three townships comprising Spenborough). The department are featuring domestic gas-appliances sold for cash or on three or six years' hire-purchase, and standard cookers rented at 3s. per quarter.

The profit of the Sutherland Meter Company for the past year, after making provision for income-tax, corporation tax, and depreciation, amounted to £2103, and in addition there was a sum of £4285 brought forward. The Directors recommend a dividend of 5 p.ct. (less tax) on the ordinary shares, leaving a balance of £4388 to go to the next account.

It having been stated at a meeting of the Torquay Traders' Association—Mr. C. F. James presiding—that the Corporation's proposal to reduce the electricity charges had been made with a view to getting people to use more electricity for cooking purposes, Mr. Bateman offered to give his electric cooker to anyone who cared to have it, and added: "It is the most expensive thing I have ever tried."

GAS REGULATION ACT, 1920.

BOYS' CALORIMETER

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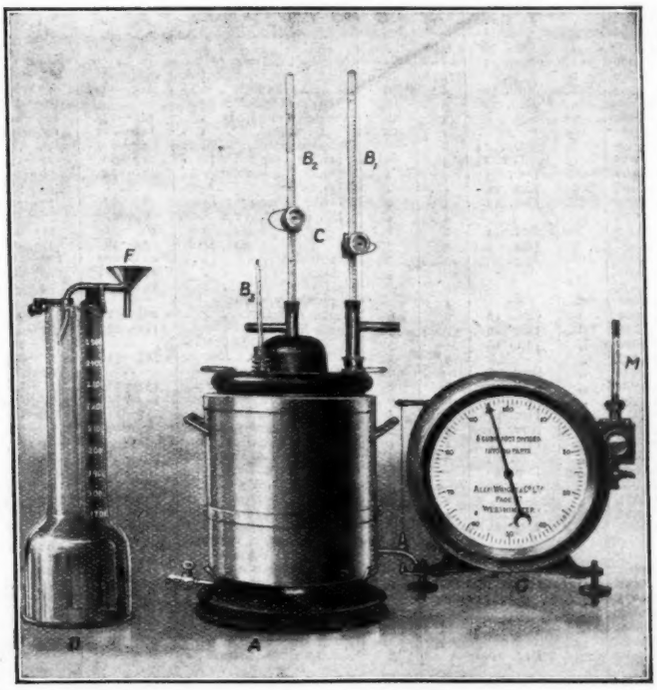

STOCK MARKET REPORT.

AT the beginning of last week business was practically at a standstill on the Stock Exchange. The failure to avert the partial strike on the railways, and the downfall of the Conservative Government were the main causes which contributed to the stagnant position. It is extremely unfortunate that the strike, for which the public were unable to find any justification, should have happened when the country is struggling to recover its livelihood.

A complete change took place as the week progressed. This was attributed to the "bears," whose accounts were unusually large, scrambling from time to time to cover. As a result, quotations were up on the week. War Loan 5 p.ct. again rose above par. Funding Loan closed on Friday at 87, and Conversion Loan at 76⅛.

In spite of the uncertainty of the future, holders of Home Rails refused to be stampeded; and, with a market bare of stock, prices improved. There was considerable strength in the Oil Market, due to the further rise in the price of crude oil; and advances were recorded in Royal Dutch, Shells, and Burmahs. Business was also better in Industrials, notably Textiles and Tobacco issues.

The gas dividend announcements indicate that companies have had a successful year; and we anticipate that the chairmen will have very satisfactory results to report at the forthcoming general meetings. The Gas Light ordinary advanced 1½ points to 92-94; South Metropolitan ordinary 2 to 93 96; Alliance and Dublin 2 to 65-70; and Primitiva ordinary ⅛ to ⅝. Decreases were recorded in European ⅝ to 6½-7½ *ex* div., Montevideo 3 to 54-59, Primitiva 4 p.ct. debenture (1911) 1 to 54-57 *ex* div., and South Metropolitan 6½ p.ct. debenture 1 to 103-105.

The following transactions were recorded during the week: On Monday, Bombay 5⅝, Brentford "A" 101, Commercial 4 p.ct. 91, 3½ p.ct. 91, Croydon maximum 85½, European 7, Gas Light and Coke 90, 90¼, 90⅜, 90⅝, 90¾, 3 p.ct. debenture 58, Oriental 100, Primitiva 6s., 6s. 3d., 6s. 4½d., 7s., 5 p.ct. preference 25s., 26s., 26s. 3d., 26s. 6d., 27s. 4½d., South Metropolitan 92, 92½, 92⅛, 6½ p.ct. debenture 104½, South Suburban 5 p.ct. debenture 95. Supplementary prices, Metropolitan (Melbourne) 7⅜, Watford 7 p.ct. debenture 100, 100½. On Tuesday, Bombay 5⅝, Brentford "A" 101, "B" 99, Brighton and Hove original 176, "A" 129, Cape Town 4½ p.ct. debenture 75½, Commercial 4 p.ct. 90, 92, Gas Light and Coke 90, 90¼, 90⅜, 4 p.ct. preference 77½, 3 p.ct. debenture 58⅞, Liverpool 7 p.ct. preference 106, Portsea Island "D" and "E" 85, 85½, Primitiva 6s. 1½d., 5 p.ct. preference 26s., 26s. 3d., 27s., South Metropolitan 93, 93½, Tottenham "B" 101½. Supplementary prices, Cape Town 5 p.ct. debentures 73. On Wednesday, Alliance and Dublin 60⅜ *ex* div., Brighton and Hove 178, "A" 130, British 115, Cape Town 4½ p.ct. debenture 76½, Gas Light and Coke 90, 90¼, 91½, Imperial Continental 136, Montevideo 54, South Metropolitan 94, 94⅜, 3 p.ct. debenture 57⅞, 58⅛ *ex* div., South Suburban 5 p.ct. 98½, Wandsworth "B" 110, 110¼. Supplementary prices, Colombo 12. On Thursday, Aldershot 74½, Brentford "A" 100, Commercial 4 p.ct. 90, 91½, 91⅜, Gas Light and Coke 89, 90⅜, 91⅛, 92, 93, 3½ p.ct. maximum 62½, Primitiva 6s., 6s. 6d., 5 p.ct. preference 26s. 3d., 26s. 6d., 26s. 9d., 27s., 27s. 1½d., 28s., South Metropolitan 94½, 94½, 95, 5 p.ct. preference 98⅛, 3 p.ct. debenture 59, 6½ p.ct. debenture 103½, 104½. Supplementary prices, British (Norwich) 3½ p.ct. debentures 58½, 59. Walton-on-Thames "A" 13⅜, 13½. On Friday, Commercial 3½ p.ct. 90, European 6½ *ex* div., Gas Light and Coke, 93, 93½, 94, 4 p.ct. preference 80, Imperial Continental 134, 135½, Malta and Mediterranean 73s. 9d., 75s., Ottoman 24s. 6d., 25s., Primitiva 6s. 4½d., 6s. 6d., 7s. 3d., 8s. 3d., 5 p.ct. preference 27s., 28s., 28s. 6d., 29s., 4 p.ct. debenture (1911) 54, 55 *ex* div., South Metropolitan 95½, Tottenham "B" 101, 101½. Supplementary prices, British Hull 3½ p.ct. debenture 58½, 59

Postal delays affected the Money Market during the week, but conditions at the close were satisfactory. The rates paid for loans indicated an ample supply of funds. The usual charge for fresh money was 2½ p.ct. The Treasury Bill rate was a few pence better than last week at £3 7s. 11½d. p.ct., and the outcome of the allotment had a steadying effect on discount rates.

The Foreign Exchanges displayed little activity. The New York rate closed at $4.22⅛. Francs were cheaper—French closed at 94.10 and Belgians at 104.35.

In the Silver Market, selling on Chinese account resulted in a slight fall on Friday to 33½d. per oz.; being the same price as on the corresponding day in the previous week.

The Bank rate is 4 p.ct., to which it was raised from 3 p.ct. on July 5. Bankers' deposit rates are 2 p.ct. The deposit rates of the discount houses are 2 p.ct. at call and 2½ p.ct. at notice.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Divid. at Rate of	NAME.	Closing Prices, July 30, 1914.	Variation. Quotations, Jan. 25.	Variation. Lowest and Highest Prices of Transactions.
£			p.c.	% p.a.				
131,978	Stk.	Aug. 9	—	5	Aldershot 5 p.c. max. C.	..	72—77	74½
217,992	,,	,,	4	4	Do. 4 p.c. Pref.	..	70—75	...
1,551,868	,,	Oct. 4	2½	5½	Alliance & Dublin Ord.	59—64	65—70	60⅜
374,000	,,	Jan. 10	4	8	Do. 4 p.c. Deb.	76—79	60—65	...
280,000	5	Oct. 18	7½	8½	Bombay, Ltd.	5½—6⅛	5—5⅛	5⅛—5⅛
100,000	10	Aug. 9	16	8	Bournemouth Gas and Water { 5 p.c. B 7 p.c. Pref. 6 p.c. 4 p.c. Deb.	..	12½—13½	...
383,110	10	,,	7	7		15—15⅛	11½—12⅜	...
115,000	10	,,	6	6		13½—14	11—12	...
162,025	—	Dec. 28	—	4	Brentford A Consolid.	..	75—80	...
992,045	Stk.	July 12	14	6½	Do. B New	261—266	98—103	100—101
734,920	,,	,,	11	5	Do. 5 p.c. Pref.	204—209	98—103	...
55,000	,,	,,	5	4	Do. 4 p.c. Deb.	109—111	90—95	...
321,400	,,	Dec. 13	4	11½	Brighton & Hove Orig.	91—93	76—81	...
214,745	,,	Aug. 23	11	8½	Do. A Ord. Stk.	208—213	175—180	176—178
244,200	,,	,,	8	5	Bristol 5 p.c. max.	154—159	127—132	129—130
1,287,500	Stk.	July 26	5	12	British A Ord.	..	93—95ᵃ	...
570,000	20	Oct. 4	12½	7	Do. 7 p.c. Pref.	44—45	115—120	115
100,000	10	Dec. 28	—	4	Do. 4 p.c. Deb. Stk.	..	120—125	...
120,000	Stk.	,,	4	6	Cape Town & Dis., Ltd.	88—90	73—78	...
100,000	10	,,	—	4½	Do. 4½ p.c. Pref.	1½—2½	6½—7½	...
100,000	10	Oct. 31	—	4½	Do. 4½ p.c. Deb. Stk.	4—6	6—7	...
150,000	Stk.	Dec. 28	4½	7½	Cardiff 7½ p.c. Deb.	70—75	73—78	75½—76½
237,860	,,	,,	—	5	Chester 5 p.c. Ord.	..	105—110	...
157,150	,,	Aug. 9	3	6	Commercial 4 p.c. Stk.	108—110	85—90ᵇ	...
1,513,280	,,	July 26	5/9/4	6	Do. 3½ p.c. do.	106—108	90—95	90—92
560,000	,,	,,	5½	3	Do. 3 p.c. Deb. Stk.	103—105	90—95	90—91
475,000	,,	Dec. 13	5	—	Continental Union, Ltd.	69½—71½	58—61	...
800,000	,,	14 Jan. 15	4	7	Do. 7 p.c. Pref.	76—79	32—37	...
800,000	,,	Dec. 13	7	6½	Croydon sliding scale.	115—118	78—83	...
660,000		Aug. 9	—	5	Do. max. div.	..	102—105	...
284,975		,,	6	4½	Derby Con. Stk.	..	85—88	83½
492,270	Stk.	—	—	4	Do. Deb. Stk.	123—125	107—110ᶜ	...
55,000	,,	—	4	4	East Hull 5 p.c. max.	102—104	74—76ᶜ	...
209,000	,,	—	—	2	European, Ltd.	..	..	...
1,002,180	10	Jan. 24	10	5½	Gas { 4 p.c. Ord. 3½ p.c. max. Light and 4 p.c. Con. Pref. 3 p.c. Con. Deb. Coke 10 p.c. Bonds 7½ p.c. Ilford Deb.	17½—18	6½—7½ᵉ	6½—7
16,546,120	Stk.	July 26	4/17/4	5½		98—102	92—94	89—94
2,600,000	,,	,,	3½	3½		76—79	62—65	62½
4,062,235	,,	,,	4	4		96—99	77—80	77½—80
4,761,930	,,	Dec. 13	5	5		72½—74½	57—60	58—58½
130,000	,,	Dec. 11	10	7½	Hastings & St. L. 5 p.c.	..	..	...
42,000	—	—	—	6½	Do. 3½ p.c.	..	..	...
84,500	,,	Sept. 19	5	5½	Hongkong & China, Ltd.	87—89	93—98	...
258,740	,,	,,	3½	5½	Hornsey 7 p.c.	16½—16⅞	78—83	...
86,600	10	Oct. 18	11	10	Imperial Continental	..	16—17	...
1,976,000	Stk.	Aug. 23	9	9½	Do. 3½ p.c. Deb. Red.	150—160	144—149	...
401,400	,,	Nov. 15	9	5	Lea Bridge Ord. 5 p.c.	84—86	133—135	134—136
235,342	,,	Aug. 9	3½	3½	Liverpool 5 p.c. Ord.	119—121	74—77	...
2,227,240	,,	,,	10	6½	,, 7 p.c. Pref.	..	95—100	...
600,000	,,	Aug. 23	—	5½	Maidstone 5 p.c.	..	88—89ᵇ	...
165,736	,,	Sept. 19	—	7	Do. 3 p.c. Deb	..	104—107ᵇ	106
63,480	,,	Aug. 23	7/5/6	9	Malta & Mediterranean	..	125—130	...
75,000	5	Dec. 28	—	—	Met. of Melbourne { 4½ p.c. Deb. 7 p.c.	..	54—59	...
50,000	100	Dec. 13	6	5		4½—4⅝	3½—3¼	73/9—75/-
341,920	Stk.	Oct. 1	4½	4½	Montevideo, Ltd.	99—101	95—98	...
1,875,892	,,	Nov. 29	4	4	Newcastle & Gatsh'd Con.	11½—12	54—59	54
250,166	,,	July 26	4½	4	Do. 4 p.c. Pref. Stk.	98½—99½	84½—85½ᵈ	...
529,705	,,	Aug. 9	—	4	Do. 3½ p.c. Deb.	..	74½—76½ᵈ	...
15,000	10	Dec. 28	3½	3½	North Middlesex 10 p.c.	82—83	72—73ᵈ	...
75,940	10	Aug. 23	—	11	,, 7 p.c.	..	16½—17½	...
500,000	Stk.	,,	7/14/0	7⅞	Oriental, Ltd.	14—15	11½—12½	...
138,120	Stk.	Nov. 29	8	9	Plym'th & Stonh'se 5 p.c.	117—122	97—102	100
60,000	50	Dec. 28	—	7½	Portsea Island, B	..	105—110	...
100,000	50	Sept. 6	13	13	C	128—131	105—110	...
1,450,345	5	,,	12	12	Do.	118—121	100—10⅝	...
2,499,800	5	29 Oct. 14	8	—	Primitiva Ord.	5½—6	6/16—2/8	6/—8/3
341,400	100	30 Dec. 15	5	—	Do. 5 p.c. Pref.	4½—5	1½—1⅝	23/—29/-
600,000	Stk.	Dec. 3	4	4	Do. 4 p.c. Deb.	91—93	70—75	...
220,335	,,	Jan. 24	4	4	Do. ,, 1911	..	54—57ᵉ	54—55
321,870	,,	Dec. 28	4	4	Do. B. Aires 4 p.c. Deb.	85—87	55—58	...
150,000	10	,,	4	6	Do. Riv. Pl. 4 p.c. Deb.	85—87	55—58	...
125,000	50	Oct. 4	6	6	San Paulo { 6 p.c. Pref. 5 p.c. Deb.	10½—11	5½—6	...
270,000	Stk.	Jan. 2	5	5		47—49	37—40	...
419,968	,,	Aug. 23	10	5	Sheffield A	223—224	100—102ᵉ	...
2,047,000	,,	,,	10	5	Do. B	222—224	100—102ᵉ	...
133,201	Stk.	,,	10	5	Do. C	220—223	99—101ᵉ	...
90,000	10	—	—	4	Shrewsbury 5 p.c.	..	..	...
5,609,895	Stk.	Oct. 18	9	6	South African	10½—11½	7—9	...
250,000	,,	July 26	5/9/4	5	South Met. Ord.	111—113	93—96	92—95½
4,895,445	,,	Jan. 10	—	5	Do. Red. Pref.	..	97—99	98½
734,000	,,	,,	3	3	Do. 5 p.c. Deb.	72½—74½	57—60	57½—59
91,500	,,	Sept. 6	—	6½	Do. 6½ p.c. Deb.	..	103—105	103½—104½
2,087,795	,,	Aug. 23	8½	8½	South Shields Con. Stk.	157—159	136—138ᵈ	...
368,837	,,	,,	6	6	S'th Suburb'n Ord. 5 p.c.	114—116	97—102	98½
647,740	,,	Dec. 28	5	5	Do. 5 p.c. Deb. Stk.	116—118	95—100	95
121,275	,,	Nov. 15	5	5	S'th'mpt'n Ord. 5 p.c. max	99—102	85—90	...
250,000	,,	Aug. 23	—	4	Do. 4 p.c. Deb. Stk.	..	74—79	...
200,000	,,	Dec. 28	—	7	Swansea 7 p.c. Pref. Stk.	..	102—104	...
120,000	,,	July 26	6	8	Do. 6½ p.c. Deb. Stk.	..	102—104	...
782,275	,,	,,	6	6½	Tottenham District { A 5 p.c. B 3½ p.c. 4 p.c. Deb.	135—138	122—127	...
181,255	,,	Dec. 13	4	4		115—117	100—105	101—101½
258,251	Stk.	Aug. 23	5	5		87—89	77—81	...
					Tynemouth 5 p.c. max.	108½—109	89—91ᵈ	...
30,000	,,	July 12	8½	9	Wandsworth, Wimbledon, and Epsom—			
255,636	,,	,,	6½	7½	Wandsworth A 5 p.c.	151—156	132—137	...
108,075	,,	,,	5/17/3	6⅝	Do. B 3½ p.c.	129—134	110—115	110—110½
140,865	,,	,,	—	6½	Da. C.	110—115	98—103	...
352,000	,,	,,	6½	7½	New Ordinary	..	..	...
98,000	,,	,,	6½	7½	Wimbledon 5 p.c.	117—122	105—110	...
88,416	,,	Dec. 28	5	5	Epsom 5 p.c.	121—126	110—115	...
					5 p.c Deb. Stk.	66—69	56—61	...

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